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Contents

EDITORIAL:

Editorial Notes	347
Development of Locomotive Design.....	348
Official Changes on Railways.....	348
The Continuance of Unfair Discrimination.....	349
New Books	349

LETTERS TO THE EDITOR:

William H. Boardman.....	350
Enginemen as Rear Flagmen; by H. W. Forman.....	350
Safety First and Money First.....	350

MISCELLANEOUS:

*William Henry Boardman.....	351
Brake Tests on the Pennsylvania.....	352
Train Accidents in January.....	354
*Henry W. Thornton.....	355
*Atlantic Type Locomotives on the Pennsylvania.....	356
The Rate Advance Hearings.....	359
Don'ts for Officers.....	360
The Pennsylvania Railroad's Safety Campaign.....	361
State Railway Operation in Western Australia; by Francis A. Bonner.....	365

MAINTENANCE OF WAY SECTION

EDITORIAL:

Editorial Notes	367
Unit Costs for Timber Treatment.....	368
New Books	368

MISCELLANEOUS:

*An Unusual Concrete Pipe Plant at Auburn, Wash.....	369
Abstract of Engineering Articles Since January 23, 1914.....	371
*The Musgrove Rail Joint.....	371
*Erecting a Long Steel Girder Span.....	372
The Economical Operation of Work Trains.....	373
*Forms for Complete Rail and Ballast Records; by Jas. G. Wishart.....	378
Creosote Oil; by P. C. Reilly.....	382
*Prevention of Water Waste on Railroads; by C. R. Knowles.....	383
Hagersville Ballast Crushing Plant of the Michigan Central.....	385
Committee Appointments of the Bridge & Building Association.....	385
*Report of Creosoted Piling in Santa Fe Galveston Bay Bridge.....	386
*The Turner Brazing Machine.....	387
Laying Rail on the Lehigh Valley.....	388
Defining Causes of Derailment.....	389
*A Portable Drag for Shifting Cars.....	389
*The Smith Hand Mixer.....	390
*The Actual Service of the Track Spike and Tie Plate; by Walter D. Wood.....	391
*The Jones Automatic Water Tank Spout Lock.....	392
GENERAL NEWS SECTION.....	393

*Illustrated.

Announcement by the Great Eastern of England that a young American general superintendent has been selected for its manager, has started a tempest in a teapot.

Mr. Thornton
and
the Great Eastern

It is impossible to give to the episode a more dignified name, for the action of the Great Eastern directors is really normal. "Infusion of new blood" is justifiable and wise even when the family blood is irreproachable. In the business-getting department—passenger and freight solicitors—a president looking for men goes outside for knowledge alone, the question of talent being hardly considered. The same element has its place in railway operation. Lord Claud Hamilton is criticized severely for slurring British young men; but he slurs his own board much worse, for he admits that English roads train their men—but that they turn out the product ten or fifteen years too late. He ought to have kept silent concerning his reasons. Railroads in eastern America get officers from a thousand miles west; and they frankly admit—the facts compel the admission—that those western men were born in the East and went West because the East was too slow. In more sedate phrase; the West, in the nature of things, afforded greater opportunities for development. But, whether we give much or little weight to questions concerning the points of the compass, no one denies that the Pennsylvania Railroad trains its officers according to scientific plans; which plans—and talented men familiar with them—are fundamentally valuable on all railroads.

From the American standpoint the lack, if lack there is, in the majority of English railroad officers lies in their failure to

The
English
Railroad Officer

utilize to the fullest extent their initiative and energies toward earning profits for their stockholders. The stockholder has invested his money because he desires to earn a profit, and as a stockholder that is his only desire. American railroad officers have put a wonderful amount of energy and brains into their work for their employers. With comparatively few exceptions, English railroad officers have risen through the ranks; but unlike American experience, a large proportion of the higher officers started as clerks and not as operating men. Furthermore, the fact that the English railroad boards of directors take a more active part in the direct management of their property tends to discourage, or at least not to encourage, the development of strongly individual initiative on the part of executive officers. A training which begins at 17 in the clerical department and only approaches completion at 50 tends to make a man conservative, thorough, painstaking and inclined to be a worshiper of tradition. The lack of early technical training or of university education is likely to incline the English railroad officer to rule of thumb methods rather than to ingenuity in solving his problems in a new or novel fashion. There are numerous and striking exceptions to the above generalizations to be found among English railroad officers.

The natural way to settle a labor issue like that which was raised on the Delaware & Hudson would be for the railroads to

Possible
Strike
Remedies

unite. The employees apply their national resources to win any little local contest, and the employers with equal right could do the same. However, it may be well that the anti-trust law restrains them (though Congress will take care that it does not restrain the employees) and the railroads will do well to direct their energies in other directions. They nearly break the anti-trust law when they join in a "conference committee" to present their case before the arbitrators who settle the brakeman's wages, for are they not "conspiring" with each other and thus becoming friends, when the law requires them to be enemies? One thing any railroad may do; and that is to memorialize

Congress and the President—agitate in any way possible—for the appointment of big men as mediators. That Albany mission should have been entrusted to two or three men of the size of Justice Hughes or William H. Taft. Are we unduly magnifying the controversy? The press universally agrees that as a disturber of the ordinary doings of society a railroad strike is of the first magnitude. If that is so, men of the highest ability should deal with it. Another very simple and just requirement to impose on our employers and employees would be that which is now in force in Canada; that employees shall not strike and employers shall not lock men out, without first giving a government officer or board an opportunity to lay the facts of the controversy before the public. Such a speed-limit device could hardly do otherwise than benefit both sides. Canada imposes no penalty for disobedience of her law; but this is, perhaps, a matter in which public opinion can apply the sufficient penalty directly, through the newspapers.

DEVELOPMENT OF LOCOMOTIVE DESIGN

DESIGNERS of American locomotives have met with frequent criticism because of a lack of refinement in their work. The care in designing, which is a conspicuous feature of most European locomotives has generally not been found practicable in this country because of the pressure under which the designing and building of locomotives has had to be done. When an American railway orders locomotives they are almost invariably needed as quickly as they can be built. But with the increases in locomotive weights during the past few years it has become plainly apparent to railway mechanical men that there must be a limit to the practice of obtaining more powerful engines by merely increasing dimensions. The locomotive development of the future must lie mainly along the lines of improved design and materials. A few years ago the American Locomotive Company took a most important step in this direction by designing and building an experimental Pacific type locomotive embodying many important new features. The results of the experimental work with this engine are now to be seen in locomotives throughout the country.

Aside from this, the special facilities possessed by the Pennsylvania Railroad for investigating matters pertaining to locomotive design and operation have had a marked effect. This is evidenced by the development on this road of an Atlantic type locomotive which undoubtedly constitutes the most advanced step recently made in locomotive design in this country. This development had its beginning in the construction in 1910 of a very large and powerful locomotive of the Atlantic type, equipped with a brick arch and a combustion chamber, but without a superheater. Careful tests were made with this engine on the testing plant at Altoona, and in 1912, after much study, a second locomotive of the same type, equipped with a Schmidt superheater and embodying a number of other improvements, was built. This locomotive was put in regular service and later given an extended series of tests on the testing plant. The present design was the result of the knowledge obtained in these tests and a number of locomotives of this type are now being built. A description is given elsewhere in this issue.

A most striking feature of the design is the lightness of the valve gear and reciprocating parts. The total weight of the locomotive is 240,000 lb., and the weight on drivers is 133,100 lb., but as the weight of the reciprocating parts on each side is less than 1,000 lb. the blow delivered to the rail is actually less than with many locomotives in which the weight per axle is much less. Another interesting part of the design, and one which has helped greatly in producing an easy riding engine, is the system of equalization. The first pair of drivers is equalized with the forward truck and the rear pair with the trailing truck. This method could undoubtedly be adapted to the Pacific type, and it seems probable that corresponding improvement in riding qualities would result. When it is remembered that these locomotives are in many cases giving better results than

can be obtained with the present Pacific type locomotives, it is interesting to consider what the possibilities of increased capacity in that type would be if similar care were exercised in improving the design.

OFFICIAL CHANGES ON RAILWAYS

THE policies followed on different railways in selecting, promoting and retiring officers, from the chairman and presidents down to the lowest ranks, differ radically. There are numerous roads on which the policy has been followed for years of appointing and promoting to official positions only men who have gained practically their whole training and experience on the property. There are other roads on which there have been occasional "shake-ups" in one department or another, which have resulted in some official positions being filled with men from other roads, but on which it has been understood that the practice, except in special cases, is to promote men who have grown up on the property. There are still other roads on which there have been "shake-up" after "shake-up," and on which it has been the rule rather than the exception for official positions all along the line to be filled with outsiders.

Often these earthquakes have followed changes in financial control. There may be no evidence that the president and other officials are not able and have not been energetic and loyal. The evidence may be all the other way. But the financiers coming into control, who are, perhaps, mere brokers in railroads, or bankers who know almost nothing about the operating problems of railways, want "their men" in charge. They may really believe that changes in the official personnel are desirable. Or, they may be merely inspired by the desire to give jobs to certain men on whom their favor chances to smile. In either event, the president of the road is "fired" and a new one installed. He, in turn, fires a lot of the other officers and replaces them with his own men. On some roads the new president and those he has brought to the property will be fortunate if they are not deprived of their places and succeeded by others before they have had a good opportunity to show what they really can do.

Unquestionably, there is apt to come a time on any road when changes involving the bringing of officers on the property from other roads may be desirable or even essential. It may be that because of past unwise appointments and promotions a road has been loaded down with incompetent officials and has no immediately available material with which to make competent ones. It may be that a number of the officials, who are otherwise competent, as was the case once on the Illinois Central, have conspired to rob the company, and that while there is good official material in lower positions it is not sufficiently developed to be promoted. But it would seem that on any road which has been measurably well-managed the occasions when it can be necessary, or even desirable, to import outside talent must be rare.

Probably the first two considerations in selecting a man for an official position should be his ability and his experience in railway service, whether on one road or another. Probably the very next consideration should be his experience, or lack of it, on the particular road to be served, for other things being equal, it is manifest that men who have experience on a road are better equipped to contribute to the success of its management than those who have not had such experience, and if they have been loyal to it this gives them an additional claim to favorable treatment. Unless the men brought to a property are actually much more capable than those they supplant they will not be able for some time to get as good results as their predecessors, simply because they will not know the property so well and because there will inevitably be a lack of sympathy and co-operation between them and the other officers of the road who have contrived to hold over from the preceding administration.

A priori reasoning would lead to the conclusion that in a great majority of cases a railway will be better operated if its management carefully and deliberately pursues the policy of training men and bestowing on them positions at its disposal; and certainly, experience supports this conclusion. In a large majority

of cases the conditions, physical and financial, are better on railways where "shake-ups" have been rare, or even unknown, than on those where they have been common. In fact, one of the main causes of the bad physical and financial conditions which obtain on a number of roads is the ignorant, cold-blooded and downright inhuman way in which numerous official changes have been made and continue to be made. Such a policy inevitably banishes from a road the official loyalty, co-operation and esprit de corps which are essential to good management and efficient operation.

The responsibility for the kaleidoscopic official changes which occur on certain railways lies, as has been intimated, chiefly with certain financial powers that be in Wall street. The *Railway Age Gazette* recently published a very interesting, timely and important paper by George M. Basford on the subject of training employees. Somebody could write an equally timely and interesting, and perhaps even more important, paper on the subject of training officers and then retaining, promoting or retiring them strictly according to their merits. And when the paper is written the most valuable part of it will be designed for the instruction of the men higher up who control the selection and promotion of the officers of railways. For it is these men higher up who are most in need of instruction along this line. If the officers of all the railways in the United States were selected and changed as those on some are the roads would all soon be physically in the scrap heap and financially in the pawn shop.

THE CONTINUANCE OF UNFAIR DISCRIMINATION

THE report of the Interstate Commerce Commission in the Industrial Railways Case, and the hearings since begun by it to stop a number of forms of unfair railway discrimination in eastern territory, have caused many comments to be made which are not just. For example, a much esteemed contemporary, the Norfolk (Va.) *Ledger-Despatch* in its issue of January 30 published an editorial entitled "Railways Still Rebating," in which it said that the disclosures made by the commission show that the impression that rebating had ceased is unfounded. "The roads," it said, "apparently ceased to give rebates on freight to the little rascals but continued to give them, and merrily, to the big ones." These statements indicate that the *Ledger-Despatch* has been given a wholly wrong impression and has conveyed that impression to its readers.

In the first place, the implication that the railways have been giving rebates to the big shippers as they did in past years is incorrect. The word "rebate" has always been used to denote a deduction made from the published tariff rates. Now, rebating of this kind was not shown in these cases and has practically ceased to exist. In this respect there has been a very great improvement within the past eight years. The rebating done prior to 1906 was secret, while every practice condemned in the Industrial Railways Case was provided for in tariffs published and filed with the Interstate Commerce Commission.

Another important point to be considered is that, while it was clear when in former times a railway deducted even a single cent from its published tariff rate that its act was criminal, neither the law, nor the decisions of the commissions or of the courts, have yet made clear either just what is an industrial railway, or what services a railway may pay a shipper for rendering, or what services, if any, in addition to its regular road haul a road may render to a shipper without extra charge, without violating the law. There has been no question that some of the services of the railways have been rendering to shippers free, and some of the allowances they have been paying to industrial railways, have constituted unfair discrimination. But in many instances just at what point the unfair discrimination begins has not yet been determined.

Finally, and very important, is the fact that the practices now denounced by the newspapers as rebating and condemned by the Interstate Commerce Commission as violations of the law, began growing up in the very earliest history of railways. They were developing when the Interstate Commerce Act went into effect 27 years ago. They have grown worse throughout

the life of the Interstate Commerce Commission. Three years ago, when the original rate advance cases were being heard, the *Railway Age Gazette* published a series of editorials denouncing the very kind of practices which are now receiving such wide publicity and condemnation. It was pointed out then clearly and fully what the nature of these practices was, how they had grown up and been perpetuated, what their results were. Attention repeatedly has been called to them since. And with what result? The commission cannot be justly criticized for considering these discriminations in connection with the rate advance case, since they are still in existence. But why did not the commission do something about them before? The answer is simply that the practices in question have grown up by insensible gradations; that until comparatively recently nobody really appreciated either the vice in them nor the extent to which they were developing; and that when these things did begin to be appreciated the problem presented had become so big and complex that neither the shippers, nor the railways, nor the commission, nor all of them together, could solve it without years of investigation and effort. The foregoing being the facts about the matter, if anybody is to be denounced for the condition that has developed, let us denounce the shippers, the railways and the commission, for all of them have their responsibility because either of faults of commission or omission. It will be more fitting now, however, since the situation is in a fair way to be cleaned up, to give credit to those to whom it is due; and that includes the shippers and railways in eastern territory for having on their own initiative put the matter before the commission, and the commission itself for having dealt with it thus far in a thorough and intelligent way.

Meantime, the kind of unfair discrimination which the commission now has under consideration is not the only kind going on. Attention repeatedly has been called by the *Railway Age Gazette* to the fact that similar discriminations are being worked by the making and keeping in effect of many rates which are too low relatively to the general level of rates. In most cases these rates are so made as to favor some large community at the expense of small communities, or some large shipper at the expense of small shippers. Congress and the Interstate Commerce Commission know of them, or have had every opportunity to learn. Probably the only remedy for them is to authorize and require the Interstate Commerce Commission to raise rates when it finds that in only that way can an unfair discrimination be fairly remedied. The railways do not raise these rates now, either because they cannot agree, or because they fear that they will be prosecuted under the Sherman anti-trust law if they do agree. Neither the press, the commission, Congress nor the public is paying any attention to these matters at present, although they demand attention just as much as the other classes of unfair discrimination which are receiving attention. No doubt, however, in about five years something will happen to direct attention to them. Then, doubtless, the press and the public will discover how wicked these things are and how wicked the railways are for letting them continue to exist. This will be followed by investigations and "disclosures." And once more the poor old railroads will become the objects of virtuous condemnation by their erstwhile partners in crime!

NEW BOOKS

Poor's Manual of Railroads for 1914. Published by the Poor's Railroad Manual Co., 535 Pearl street, New York.

This is the forty-seventh annual number of this standard manual. Although both public utilities and industrials have been entirely taken out and are published in separate manuals, Poor's Manual of Railroads for 1914 contains 2,052 pages of text. It is needless to say that it is the most reliable and carefully compiled work of the kind on the subject of American railroads. The 1914 edition is about a month early in the year this year than any previous edition. For the first time in any railroad manual complete information is given as to whether or not interest on railroad bonds is payable without deduction for the normal United States income tax.

Letters to the Editor

WILLIAM H. BOARDMAN

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I have read with interest and appreciation Colonel Prout's excellent biographical notes on Mr. Boardman, and I want to add my own tribute to the man with whom I worked in the closest association for so many years.

From the standpoint of a young man starting out to win his spurs, I cannot imagine a more inspiring leader than Mr. Boardman was. He had a peculiar sympathy for the young man's point of view and regarded his mistakes as a necessary part of his training for wider usefulness and not at all as a subject for condemnation or severe criticism. I know of no surer way to promote loyalty and enthusiasm on the part of subordinates than to give them this wide measure of personal freedom and responsibility; and Mr. Boardman's very confidence that his organization would handle things right and find the correct solution for their problems, was a sure and direct method of building up both loyalty and efficiency within the organization.

In a world somewhat given to materialism, it was also an inspiration to work for a man who was much more concerned with the quality of a job and the ideal sought for than with the dollars and cents standard of measuring results and attainment.

Mr. Boardman was keenly interested in the advertiser's point of view, and in the kind of service which a technical journal ought to give to its advertising customers; but in all my experience with him, I never knew him to allow this point of view to affect in the slightest degree the integrity of the editorial columns. He contributed much valuable pioneer work to the marked increase in editorial independence which has characterized the development of technical journalism during the last fifteen years.

His view point of commercial life and of technical and economic subjects always centered on the individual; the man that did it; and his friends and associates will mourn his loss as a friend who always believed the best of them and who helped them to achieve because he did believe it.

RAY MORRIS.

ENGINEMEN AS REAR FLAGMEN

NASHVILLE, Tenn., February 10, 1914.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I have just read Colonel Haines' "plea for the fusee," in the *Railway Age Gazette* of the 6th. All of our engines (the Nashville, Chattanooga & St. Louis) are equipped with fusees torpedoes, etc., and engine-men are instructed to use them when they know that they must soon stop on account of engine trouble, or other cause known only to them at the time. But to place upon the engineer the sole duty of dropping fusees under all circumstances would be neither practicable nor safe. He has not the time, for one thing; and in case his train be a long one, say 75 freight cars, the fusee would not be far enough back of the train to be of much use; and possibly, in some cases, not so far back as the rear of the train. It is of course proper for the engineer to blow back a flag before stopping when he knows he must soon stop and that he will likely be delayed.

For the present, I will pin my faith to the much-abused flagman. Select young, active men who have the proper sense of right and wrong, who wish to retain their positions and eventually secure promotion, and you have solved the matter as nearly as it can be solved at present. Is this man always given the proper show? Rarely do I make an inspection trip that I do not

see obstructions that should be removed so that engineers can better see a train ahead. Cut down the trees; induce owners of elevators and other industries near signals to paint their buildings some other color than red; require engineers to somewhat reduce speed within yard limits. Cut out this senseless speeding up to 70 or 80 miles an hour with passengers and 50 to 60 miles an hour with freight trains, regardless of unfavorable conditions. Work a few simple reforms and there will not be so many rear collisions. In other words, get back to safe, common sense railroading.

I might add that on practically all roads [not worked under the space interval] all classes of trains, except possibly passenger trains, are allowed to run too closely together. I recall instances where the same thing was permitted with passenger trains. A hose bursts, the flagman has not time to get back far enough to stop a train following too closely, and we have the usual interesting reading in the next morning's paper, that either the flagman did not get back as he should, or that the track spread.

I almost forgot to pay my respects to the "average" flagman. There are some who do not flag properly; never did, never intend to. Just say to one and all that they are to flag properly in all cases hereafter or else leave the service for good and all. Do not bluff. Give them every show, and then if they neglect their duty dismiss them at once. Do not wait until a collision results through their neglect. I have in mind a neighboring road that had a good many accidents up to a few years ago. They are not having many now. The plan outlined above was adopted by them to secure better service; and it worked.

H. W. FORMAN.

SAFETY FIRST AND MONEY FIRST

NEW YORK, January 13, 1914.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

There has been so much noise made about the "safety first" movement that I have been watching for evidences of its application. In some places the movement seems to have taken a very strong hold, and the first thought in all cases is really for safety; but there are other places where it has evidently never been heard of.

At the 135th street station of the Sixth and Ninth Avenue Elevated railroads there are signs cautioning passengers and employees against crossing the tracks, but the pay car stands on the middle track. All employees must jump off of the platform, endangering their lives from the jump, because of the many moving trains, and from the deadly third rail, in order to get to this car. In fact it makes one shudder to stand on the platform and see the risks taken by the employees. So great is their anxiety to get quickly to the official car that they drop off the platform only a short distance ahead of trains, and scramble for the center track, apparently regardless of the third rail. One employee was actually seen to climb over a gate on a train as it pulled into the station and take a clean drop from the car platform to the middle track while the train was still in motion. It would appear as though these men had never heard of safety, first, last or at any other time.

As a picture on the other side of the question, an incident which occurred on the Lackawanna Railroad some little time ago may be of interest. Just as the 8:30 a. m. train for New York was pulling out of the station at Ampere an automobile was seen dashing up to the platform. An elderly gentleman was preparing to leap from the car and run for the moving train. The rear brakeman on the train took in the situation at a glance, realized the danger, and promptly pulled the cord to stop the train. Some of the passengers on the train growled to the brakeman that he must have mistaken this gentleman for the president of the road, but he merely replied: "No, Safety First."

C. J. MORRISON.

WILLIAM HENRY BOARDMAN

William Henry Boardman, for many years president, and for eight years (1903-11) editor, of the *Railway Age Gazette*, died at his home in Ridgefield, Conn., on the morning of February 16, 1914. He had been seriously ill since early in 1911.

William Henry Boardman was born in Dixon, Ill., August 3, 1846. On both sides of the house his ancestors were of substantial English stock, and the town of Dixon was named after his maternal grandfather. In Dixon he grew to manhood a strong, active, enterprising boy, fond of the outdoor sports of that time and place, and particularly fond of shooting the small game of the prairie country; and he came to be an uncommonly good shot. To the end of his life the prairies kept their place in his memory and his imagination, although he came to know well and to love many other aspects of nature.

His father was a man of consequence in the community and amongst other enterprises owned and published a local newspaper, *The Dixon Telegraph*. In the office of this paper young Boardman picked up many details of printing and publishing, which later were of use to him in the principal business of his life.

In due time, Boardman went to the University of Michigan, where he stayed five years and took two degrees in course, Bachelor of Arts and Civil Engineer. Of his undergraduate days there is nothing remarkable to relate. He was a tall, strong youngster, with fair hair and energetic blue eyes. His abounding vitality led him into more than the average of undergraduate scrapes, from which his original mind, his cool and patient temper and his reliable fund of humor extricated him with no serious consequences; and he always had the good opinion and the confidence of the faculty and of his fellow students. During these years the Survey of the Great Lakes was being carried on by the Engineer Bureau of the War Department, involving geodetic and hydrographic work of the first class. A few of the University of Michigan undergraduates found vacation employment on this survey, and Boardman had some of this experience which opened up to him a new knowledge of men and things that helped materially to make practical his education.

Boardman finished his college life in June, 1869, and spent a few months in Dixon, occupied chiefly with the affairs of his father's newspaper, and then took employment with the *Railroad Gazette*, which was owned by A. N. Kellogg, and was pub-

lished in Chicago. From that day until his death, Boardman's life was spent in the service of what is now the *Railway Age Gazette*, with the exception of one year in another newspaper enterprise which was not successful.

Mr. Kellogg was a man of originality, enterprise and acumen, and the *Railroad Gazette* was only one of the ventures which he was carrying on, and to it he could give but a comparatively small part of his time and attention. He had been so wise and so fortunate as to engage for the editorial staff of the paper S. Wright Dunning, of Chicago, and Matthais N. Forney, of New York, who had been with the paper one and two years, respectively, when young Boardman joined the staff. Boardman's principal work at that time and for many years after, was in the business department, although he was naturally and inevitably constantly in close touch with the editorial department.

The great Chicago fire in the fall of 1871 left Mr. Kellogg loaded with responsibilities and obligations, and pretty well stripped of material resources, and he was glad to sell the *Railroad Gazette* to Dunning and Forney, who moved it to New York in the autumn of 1871, taking with them young Boardman.

The enterprise, thus deprived of some of its former resources and starting out in a new place, was, in truth, an "infant industry" and the situation demanded careful business as well as editorial management; and young Boardman had to serve as bookkeeper, cashier, treasurer, advertising manager, office manager and publisher, all of which he did with excellent business sense and with untiring industry, energy and thrift. Naturally he was in constant and intimate touch with the owners of the paper who fixed its policy and who watched its general conduct; but the business details fell more and more into the hands of Boardman.

The paper prospered steadily; it paid its debts and earned its own working capital; it grew in authority and repute; and, with that foundation, its material success was

established, provided the business side of the enterprise was carried on with steady attention to details and with reasonable enterprise. It happened, however, that Boardman could bring to the situation more than merely common-place qualities. He developed business ability of fine order in many directions, and as time went on the responsibility for all of the publishing side of the enterprise in general and in detail was left more and more to his care.

In 1883 Boardman bought most of Forney's holdings; and



William Henry Boardman

in January of the following year Forney retired as president, although he remained a director of the company until 1886. On January 1, 1887, Dunning retired from all active and responsible connection with the paper, although he held and still holds an interest in it, and has never entirely ceased to write for it. It should never be forgotten that Dunning and Forney were the real founders of the *Railroad Gazette*. They gave it its character, which has never been materially changed.

With Dunning's retirement, Boardman increased his holdings, became president and from that time until forced by illness to retire, he was in supreme authority and ruled as a mild and enlightened despot.

In February, 1903, Henry G. Prout, who for 16 years had been editor of the *Railroad Gazette*, withdrew, and Boardman assumed the duties and responsibilities of editor. In the following year the property was enlarged through purchase of *Transport*, of London (now the *Railway Gazette*), the controlling interest in which was later sold; and in 1908 by acquiring the *Railway Age*; in 1910, *The Signal Engineer*, and in 1912 the *American Engineer & Railroad Journal* (now the Mechanical Edition of the *Railway Age Gazette*).

It is not necessary or proper to say more as to the editorial or business conduct of the paper. Such as it is, the *Railroad Gazette* (now the *Railway Age Gazette*) stands as the monument of Dunning, Forney and Boardman.

In 1878 Boardman established his home in Franklin (now Nutley) New Jersey, and there he lived for 22 years. He at once took a leading place in the activities of the neighborhood. He served as an officer in the town government and as president of the School Board and as an officer of various social and sporting clubs. When he was not in office he was the sage and adviser in town politics; and if he was not in office it was because he did not wish to be. In a word, he was public spirited and efficient and he left a broad and deep mark on the civic and social conditions of the town.

For many years he was an active member and officer and finally president of the Adirondack League Club. Here again his zeal and efficiency helped that important organization in many ways. So it was his life long, and in numberless situations. He was recognized by his fellowmen as one of those real rare beings who can really do things and do them well; whose counsel is always to be had and is worth having. Naturally he became associated from time to time with many affairs as an investor and as an adviser.

Boardman was blessed with a genuine love for outdoor sports that remained active till his last long illness. He was a pioneer in lawn tennis in America. In 1878 or thereabouts lawn tennis was so little known here that his friend Frank Stockton asked him to write a description of the game for "St. Nicholas," which he did with characteristic alacrity although he did not know the dimensions of a tennis court. Not long afterward he, with another friend, patented a tennis racket which paid them royalties for some years.

He took up golf early in its life in the United States and helped to establish at least one important club; and he contrived to get time to play on many of the best links in the United States, England and Scotland. He shot and hunted until quite recent years; but he loved trout fishing better than any other sport. He followed it with intelligent enthusiasm for years and became a noted fly caster; but as often happens with genuine sportsmen and lovers of nature, he came to care more and more for the game and the trout and the woods and the hills than for the sport of catching and killing. He studied the habits of the deer in the Adirondacks. He interested himself in fish culture and in stocking the waters. He studied the trees and the trails and the lakes and streams and hills, because he loved them; and he wrote a charming little book, "*The Lovers of the Woods*," full of real sympathy with the forests and their populations. He knew well many of the best men of America and England, but he enjoyed no men more than the guides of the North Woods, and they enjoyed him.

Boardman had a quick and clear mind. His thought was shrewd and direct, not given to speculation, but keen for the essentials. With those qualities and with a reliable sense of humor it followed naturally that his speech and writing were compact and vivid. Vagueness of thought and mere rhetoric in speech and writing were repugnant to his nature. Somewhat late in life he developed a gift for after-dinner speaking; whimsical, witty, terse and original; a gift that was appreciated on both sides of the Atlantic. A quality of shyness that he never entirely overcame prevented the discovery of this gift earlier, but it was all the better for coming to the surface a little late, for he then spoke with a back-ground of rich experience and observation.

Boardman had to a remarkable degree the quality of becoming interested in men and things, and he had a rare gift of enthusiasm. These enviable endowments remained with him to the end of his life and kept him young to the last. To these may be added, warm affection. Thus, as a companion, in the world, and in the club and in his own family circle, he was one of the most attractive men. He reared a large family, and to them he was not only the kindest and best of fathers, but the most sympathetic of comrades. The blue-eyed, tow-headed boy from the Illinois prairies took his place amongst men in Chicago and New York and London. He was a good specimen of our versatile, humorous, efficient and enterprising race.

H. G. P.

BRAKE TESTS ON THE PENNSYLVANIA

On page 311 of the February 13, 1914, issue of the *Railway Age Gazette*, there was published an abstract of a paper presented on February 10, by S. W. Dudley, assistant chief engineer, Westinghouse Air Brake Company, before the American Society of Mechanical Engineers, dealing with the brake tests conducted by the Westinghouse Company and the Pennsylvania Railroad.

The paper was discussed by a number of railway and air brake men. Extracts from some of the more important parts of the discussion follow:

P. J. Kelley, consulting air brake engineer, New York Central Lines.—Mr. Dudley has mentioned the fact that the wheel sliding under brake application is largely due to rail adhesion. I am inclined to agree with him, but also to go a little further and say that the percentage of braking power that we employ, within reasonable limits, say 180 per cent., is really not in itself the cause of wheels sliding, but when we start the brake into action, with the trucks and gears that are familiar to us, these forces are not evenly distributed over all the wheels, and the design of truck is such that the weight can be momentarily entirely shifted from one or more of the wheels. Then with the older trucks, and the brake shoes applied to one side, there is no resiliency, and we get a strong tendency for wheels to slide. In long trains where the action of the brake between the front and the rear of the train is so slow that the brakes can be effectively applied in one portion of the train before those in the other portion of the train come into action, shocks are set up which in themselves, are very productive of wheel sliding even when the rail adhesion is up to the highest and the percentage of braking power is low. Recently in a train of nine cars, with the highest braking power probably 115 per cent., and an average throughout the train of about 85 per cent., the brake pipe was broken off on the fourth car from the rear. Every car ahead of the rear car came to a stop without injury to the wheels. They were the ones on which the braking power was low. The rear car had normal braking power, and all but two pairs of wheels under it were slid very flat. It could not be explained in any other way than that when the brake application was started from the fourth car, in opposite directions, there was not only a braking power acting on the wheels, but also the shock set up because of the difference in time and the difference in the power with which the brakes went on.

The clasp brake gear will not dispense with the shock, but it can go a long way towards keeping the wheels in the truck about in their normal position with relation to the other parts, so that whatever spring action is available will tend to keep the wheel where it belongs and to keep the rail adhesion uniform. The clasp brake also goes a long way towards giving us freedom from hot boxes, because with the percentages of braking power that we have to use today, if we impress the whole pressure upon one side of the wheel, it brings a considerable thrust on the boxes, and these pressures are often productive of hot journals. We have had considerable experience now with clasp brakes on a number of our cars during the present winter, and we find that accumulations of snow and ice are formed higher, and we do not get so much on the shoe or the hub, so that in an emergency application, when the shoe becomes hot there is not so much moisture to drip off and alight on the rails to reduce the friction.

H. H. Vaughan, assistant to vice-president, Canadian Pacific.—About a year ago we went into the question of flanged shoes to reduce the brake shoe pressures, and found an extraordinary increase in wheels slid, especially in cold weather. We then tried the use of unflanged shoes, without any other change, and the sliding reduced. I have no reason to offer for the number of wheels slid with flanged shoes, but it has occurred in our experience, and is very serious and expensive, especially in cold weather. With us, wheel sliding is undoubtedly a prominent cause of shelled out tires. When it is known that we rarely run a car over 6,000 miles in winter without having a wheel with shelled out tires, the seriousness of the matter can be easily imagined.

In discussing the paper in general, I think the first thing that strikes every one is the perfectly marvelous ingenuity of the whole apparatus. It is certainly a wonderful piece of mechanical invention, and I cannot help wondering, when we look at it, where we are going to get to in this air brake matter. I do not wish to raise a discordant voice, but are we wise, are the railroad companies wise, is the Westinghouse Company wise, in the continued development along these lines? Is it possible, or would it be possible, to design the electro-pneumatic brake without this complication? Mr. Dudley did not attempt to describe the illustration showing the complication of the brake. Are we going to be able to get men at 25 cents an hour who will be able to tell us what is wrong with that equipment? I consider that, supplementing this paper, the Westinghouse Company should tell us what is necessary in the straight electro-pneumatic brake in which the train pipe carries the air and the electricity makes the application, and I venture to say that it would be an exceedingly simple and highly efficient apparatus.

It is not a serious matter to look forward to carrying two sets of brakes on our trains in the transition period. If you go to Europe, you will find cars that carry four sets of brakes. It looks bad, but it is not as serious as it looks. We could probably cut out two or three of the offshoots in the way of reservoirs which you see presented. It is a serious matter to go into the use of an air brake which now is interchanged with the existing brake, but to go into the use of an electro-pneumatic brake is not a serious matter. I am prepared to place and keep the equipment on certain trains and to take it off certain trains for a few years, rather than to continue this enormous increase in complication. I may be wrong—it may be that an electro-pneumatic brake of itself is very complicated, but I cannot help thinking that an electro-pneumatic brake, even with the safety automatic feature on the air pipe, so that a fracture of an air pipe would cause the application of the brakes, would not be anything like the complication we are getting into today in order to make these things interchangeable and universal.

It would be an error, I acknowledge, to question the work that has been put on apparatus of this sort, but, candidly speaking, as a railroad man, I am afraid of it. It is a beautiful piece of apparatus, but if we can by simple electric control (and it does

not seem that the difficulties are insuperable) get a simple, cheap brake, that our men can understand, and with which they can locate the troubles, and know what they are doing, it would be very much better.

W. B. Turner, chief engineer, Westinghouse Air Brake Company.—I will not attempt, at present, to answer the various points raised by Mr. Vaughan, but will refer him to a paper which I read before the Franklin Institute, Philadelphia, for considerable information along these lines. So far as I am personally concerned, I desire to say that the electro-pneumatic apparatus can be applied to practically any equipment that has been built up to the present time, and will function in a satisfactory manner. To do the work that is done by the brake shown here tonight, that is, to accomplish the results which have been detailed to you, it is absolutely essential to have exactly the equipment shown or its equivalent. I would welcome any apparatus more simple than that which you have seen presented here, but if you desire to do the things which are necessary to control the trains today, particularly during the transition period, it is essential to have substantially this apparatus. An electro-pneumatic brake can be applied to any brake equipment that is in existence, but it will not do what this apparatus will do.

When Mr. Vaughan gets through with his two or three brake equipments, and the supplemental devices for cutting the brakes out, etc., I think he would find that the equipment he would have would be vastly more complex than this.

F. W. Sargent, American Brake Shoe & Foundry Company.—It is our practice in testing brake shoes on a machine to make a certain number of runs with the shoe to get it down to a good bearing, and then make a number of records and average them. In the case of machine tests, we have a number of shoes, which have been repeatedly tested to make our average, and I believe that the average corresponds very nearly with the equipment on one train. I should think the average figures we get from our machine would be comparable and should give the results indicated on the train, and the great variation shown in the train records as here presented must be due to some defect in the foundation brake rigging rather than to all the brake shoes being bad at one time.

I notice in the report quite an agreement between the results of the brake shoe testing machine and the road tests, which is extremely gratifying. This is the first series of tests I know anything about in which some of the shoes have been checked up on the machine. When we first started testing shoes on the machine, we ran up against some variable conditions, which were greatest in the new heavy, solid shoes. There was a warping, and a very large variation in the stop made, and in the mean co-efficient of friction with the same shoes; but as we wore the shoes down, and especially when they cracked and fitted the wheel better, the results became more uniform. As we got down to the pretty thin shoes, near the point where they ought to be removed, it developed under the extreme pressures which are common to modern equipment, with the single brake, that we were reaching the danger point in the thin brake shoe.

I think the objection made by Mr. Vaughan to the flanged shoe was due to the fact that the brake rigging was not adapted to that kind of shoe.

R. R. Potter, New York Westchester & Boston.—Some tests were made recently on the New York, Westchester & Boston to determine the efficiency of the clasp brake. The cars, operated electrically, weighed 60 tons, and were run as high as 60 miles an hour. In making the test the motor truck, which has clasp brakes, was put under the trailer end of the car, which normally has a simple truck, and in making a test at 35 miles an hour, the deceleration in an emergency application was found to be four miles per hour per second, with the clasp brake. With the simple brake, at 35 miles per hour, it was 3.3 miles per hour per second. At 50 miles per hour with the clasp brake, the deceleration was 3.65 miles per hour per second; with the standard brake, it was three miles per hour per second. The length

of stop with the clasp brake, at 50 miles per hour was 585 feet. With the simple or standard brake it was 690 feet. That was the average length of stop for about 40 stops. Invariably the stops were shorter when the clasp brake was used.

S. G. Thomson, Philadelphia & Reading.—We have the clasp brake on six wheel trucks and some on four wheel trucks on passenger coaches. All are giving excellent service, and it seems to me that that is where we should attack the problem, rather than in the electrical development, at least, for a few years to come. Could we not try to get along for a few more years by extending the use of the clasp brake? Let the electrical development be a matter of gradual unfolding. We have shown in the technical discussions here the wonderful improvements which can be made by changes in the cylinders and the use of different types of brake shoes and different leverages. It may be that the electro-pneumatic equipment could be specialized on a few long trains. No doubt, when we come to the long trains, the extra surging can be beautifully controlled, but how many of our trains, taking the whole of the United States, are in that particular service? We run lots of three and five car trains where this apparatus is not really required.

S. W. Dudley.—A point was raised in regard to the sliding of the wheels on a wet rail. It is known that a rail after a heavy downpour of rain is a better rail for stopping than a dry rail. The greasy rail, a rail moist from a light fog or mist, is one of the worst rails we can have. But with that comes this one relation—that the rail condition which is most likely to cause wheel sliding is also the rail condition which is less likely to cause flattening of the wheel, the fact being that sliding on a dry rail will often flatten wheels much more than sliding on a frosty or wet rail. Other calculations must also be made, because with the heavy cars of the present time the rail is apt to be cleaned off by the first one or two wheels which slide. The rail which is oily or greasy is apt to give the longest slide.

TRAIN ACCIDENTS IN JANUARY.¹

Following is a list of the most notable train accidents that occurred on railways of the United States in the month of January, 1914:

Collisions.					
Date.	Road.	Place.	Kind of Accident.	Kind of train.	Kil'd. Inj'd.
14.	Del. & H.	Albany.	xc.	F. & F.	1 0
18.	C. N. Eng.	Towners.	rc.	F. & F.	0 2
19.	West. Md.	Meyersdale.	bc.	F. & F.	1 3
†25.	Mich. Cent.	Jackson.	bc.	P. & F.	4 12
29.	Penn.	Conemaugh.	rc.	P. & F.	3 0
30.	S. A. L.	Pembroke, N. C.	xc.	P. & P.	0 6
	A. C. L.				
Derailments.					
Date.	Road.	Place.	Cause of Derailm't.	Kind of train.	Kil'd. Inj'd.
3.	N. O. Mobile & C.	New Albany.	unx.	P.	1 14
†9.	Georgia S. & F.	Cordele	b. rail.	P.	2 26
18.	Southern	Davidson.	malice.	P.	2 0
31.	Chi. & Alton.	Lockport.	b. rail.	P.	0 13

The collision which occurred at Albany, N. Y., on the morning of the 14th was between a yard engine moving backwards and a train of empty passenger cars. One engineman was killed. The cause of the collision was a misunderstanding of signals.

The two trains in collision at Towners, N. Y., on the 18th, were westbound freights. The preceding train had been stalled on a grade. The following train came on at good speed and ten of the cars of the standing train were wrecked and the wreck fell down a bank. Two trainmen were injured.

¹Abbreviations and marks used in Accident List:
rc, Rear collision—bc, Butting collision—xc, Other collisions—b, Broken—d, Defective—unf, Unforeseen obstruction—unx, Unexplained—derail, Open derailing switch—ms, Misplaced switch—acc, obst., Accidental obstruction—malice, Malicious obstruction of track, etc.—boiler, Explosion of locomotive on road—fire, Cars burned while running—P. or Pass., Passenger train—F. or Ft., Freight train (including empty engines, work trains, etc.)—Asterisk, Wreck wholly or partly destroyed by fire—Dagger, One or more passengers killed.

The trains in collision at Meyersdale, Pa., on the 19th, were an eastbound freight and a westbound train consisting of a locomotive and a caboose. Four trainmen were injured, one of them fatally. The responsibility for the collision is charged against the engineman of the eastbound train, who was killed. He overlooked an order.

The trains in collision near Jackson, Mich., on Sunday night, January 25, were a southbound passenger and a northbound freight, both running at good speed. The baggage car mounted the smoker and was telescoped into it, but the underframes of these cars were not materially damaged. Three passengers and one employee were killed and twelve passengers were injured. The collision was caused by the failure of the engineman and the conductor of the freight train to look at their time table and note the fact that the passenger train was properly scheduled thereon, and shown to run Sundays only.

In the collision near Conemaugh, Pa., on the 29th, westbound passenger train No. 19 ran into the rear of a preceding train consisting of an engine and a caboose, wrecking the caboose and killing the conductor and two brakemen. The engine and first car of train No. 19 were also derailed, but no person on this train was seriously injured. There was a dense fog at the time. The cause of the collision was the failure of the engineman of train No. 19 to observe automatic block signals, together with the failure of the trainmen of the train which was run into to protect themselves properly.

The collision at the crossing of the Seaboard Air Line and the Atlantic Coast Line at Pembroke, N. C., on the 30th, was between passenger trains. That of the Seaboard Air Line ran into one of the Atlantic Coast Line, damaging two cars of the last named train and injuring six passengers. The cause of the collision was an error on the part of the Seaboard engineman, who miscalculated distance in a fog.

The train derailed near New Albany, Miss., on the 3rd, was a northbound mixed train and the passenger car was overturned. A brakeman was killed and the conductor and thirteen passengers were injured.

The train derailed near Cordele, Ga., on the morning of the ninth, was a southbound through passenger, and five cars fell down a bank. Two passengers were killed and 26 injured. The cause of the derailment was a broken rail which proved to have been piped.

The train derailed at Davidson, N. C., on the 18th, was a westbound passenger. The engine was overturned and the engineman and fireman killed, but the passenger cars suffered little damage, the speed of the train having been low. The cause of the derailment was an obstruction (a spike) placed on the rail by children.

The train derailed near Lockport, Ill., on the 31st, was westbound passenger No. 7, and one car was overturned. Thirteen passengers were injured, none of them seriously. The cause of the derailment was a defective rail; one which was piped its whole length.

Street Car Accident.—In the wreck of a street car at a railroad crossing in Memphis, Tenn., on the 5th of January, five passengers were killed and a larger number injured, the street car being overturned. The car was run into by a freight train, said to have been moving backward in the night with no light on the leading car. The mayor of the city and the commissioner of public utilities at once had the tracks at the crossing torn up, an order requiring the owner of the tracks to tear them up, which had been issued by the city some days before, having been disregarded. The railroad, however, soon secured an injunction against the officers of the city, and the track was restored.

Canada.—A passenger train of the Canadian Pacific was derailed at Meath, Ontario, on the 22nd of January, and two cars were overturned. One passenger was killed and 15 were injured. The injured suffered severely from the cold while waiting for a relief train.

HENRY W. THORNTON

Henry Worth Thornton, general superintendent of the Long Island Railroad, has been appointed general manager of the Great Eastern Railway of England, with headquarters in London. In making the announcement of the appointment Lord Claud Hamilton, chairman of the board of directors of the Great Eastern, besides making some observations in regard to the dearth of material for railroad officers in England, which remarks are commented on elsewhere in this issue, said: "We have appointed Henry W. Thornton, of the Long Island, which works under the authority of the Pennsylvania, the premier railroad of the world. His career has been one succession of railroad triumphs, and from our point of view there is also the advantage that he has worked on the biggest system of electrically operated suburban traffic in the United States. He comes at the age of 41, whereas we seldom promote a man to the general managership until he has seen his best days physically if not intellectually."

"Mr. Thornton told me that he would do nothing hasty; in fact, in answer to such a suggestion he said: 'I mean to endeavor to enlist the confidence and support of every member of the staff from top to bottom, and having done that, I shall endeavor to lead them to support me in such reforms as I, with the concurrence of the board, may consider desirable.'"

"I know the appointment will be criticised, but I point to the great success which the District Railway, which is part of the London Underground, has had with the importation of Mr. Stanley."

The Pennsylvania Railroad differs in some respects quite markedly from any other railroad organization in the United States. Whereas much the greater part of the remarkable progress that has been made in the development of railroading in the United States has been the result of the application to the work of the individual genius of men like Huntington, Hill and Harriman, the Pennsylvania has sought not to attract geniuses to its staff, but to perfect a system into which a young man could enter with reasonable hopes of advancement, slow, possibly, but in the end commensurate with his merits. The organization itself of the Pennsylvania has been something apart from the temporary personnel of the officers who filled it. Pennsylvania officers, therefore, have the advantage of having had by the time they have reached the age of 40 a thorough course of training in the fundamental scientific principles of railroading that is probably not equalled by any other railroad organization in the world. It is as a graduate of this school that Mr. Thornton goes to England to undertake a task made unnecessarily difficult for him at the very outset.

Added to this training is the experience of the last three years on the Long Island. When Mr. Thornton went to the

Long Island the road was in the very midst of the transition period from operation by steam to operation by electricity. The joint operation of these lines by both steam and electricity, of a very heavy suburban passenger traffic, complicated by an extensive program of construction and of the new situation arising from the opening of the tubes under the East River into the Pennsylvania station in Manhattan, presented a series of problems for which it would be hard to find a parallel.

Mr. Thornton was born on November 6, 1871, at Logansport, Indiana, and was educated at St. Paul's School, Concord, New Hampshire, and later studied civil engineering at the University of Pennsylvania, graduating in 1894 with the degree of bachelor of science. He began railway work in December of the same year on the Pennsylvania Lines west of Pittsburgh, and he remained on those lines about 16 years.

He was first employed as draftsman in the chief engineer's office, and he held various positions in that office and the construction department until June, 1897, when he was appointed supervisor at Columbus, Ohio. From November, 1897, to April, 1899, he was assistant engineer of the Cincinnati division and then for seven months was engaged in special work under the general manager. He was appointed engineer of maintenance of way of the Erie & Ashtabula division on November 1, 1899, and in March, 1901, was made superintendent of the Marietta division. In May, 1902, he was appointed superintendent of the Cleveland, Akron & Columbus and on December 23, of the same year he returned to the Erie & Ashtabula division as superintendent. On February 1, 1911, he was appointed assistant general superintendent of the Long Island and the following November was promoted to general superintendent.

Mr. Thornton went to England in January, and his resignation of his position on the Long Island came by cable. President Peters said "Thornton was one of the best of the younger officers on the Pennsylvania affiliated lines. He was particularly well equipped as a promoter of pleasant relations between the company and its employees, the shippers, and the public in general. We keenly regret that we are to lose Mr. Thornton's services."

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DEEPENING OF THE SUEZ CANAL.—The London office of the Suez Canal Company has announced that the maximum draft of water authorized in the canal has been increased 1 ft., thus making it 29 ft. The last occasion on which an increased draught of the canal was authorized was six years ago, on January 1, 1908, when the depth was increased to 28 ft. The depth was originally stated in terms of meters and centimeters when the company was under French management. Since 1906, however, owing to the preponderance of British shipping in the canal, the depth has been calculated in feet and inches.



H. W. Thornton

Atlantic Type Locomotives on the Pennsylvania

Notable Results Obtained from Careful Designing and Special Attention Given to Selecting Material

The most advanced locomotive design in America at the present time is an Atlantic type developed by the Pennsylvania Railroad. This design is prominent because of the fact that it has a weight on drivers equal to the heaviest ever used in this country, the lightest weight of reciprocating parts of any locomotive with equal sized cylinders, the greatest capacity for sustained pull at the drawbar at high speed, the use of a new method of equalization, and because of the perfection and refinement obtaining in all of its details.

The high state of perfection reached in this design is the result of several years' study and experiment. On the basis

weight on drivers is 133,100 lb. This apparently excessive weight on the drivers is permissible because the dynamic augment per wheel due to the counterbalance, at a speed of 70 miles an hour, is less than 30 per cent. of the static weight on drivers. As a result, these locomotives do not deliver as heavy a blow on the rail, nor do they have as bad an effect on the track so far as strain is concerned, as the majority of passenger locomotives which have a weight on drivers of from 10,000 lb. to 12,000 lb. less per axle.

It is because of this feature that it is possible to apply the very powerful boiler that is used. The sustained capacity of



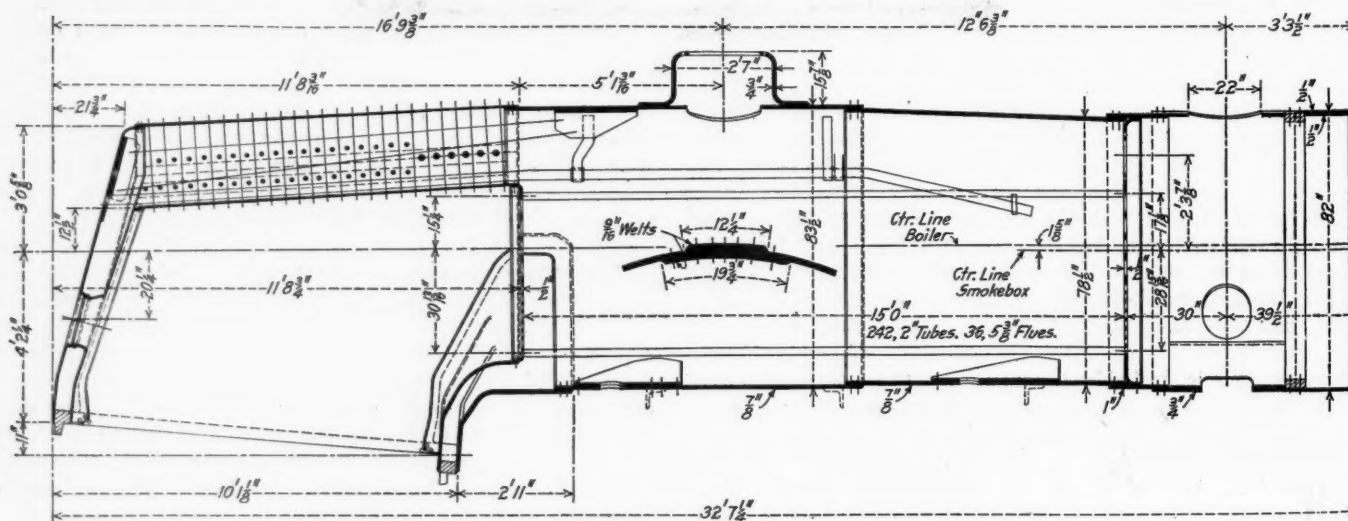
Atlantic Type Locomotive in Which Good Results Have Been Attained by Using Heat Treated Steel

of the tests and service of two previous Atlantic type locomotives the present design was made. A few engines were built, and after a short service had shown that the desired ends had been reached, orders were placed for a number of the same class, which are now under construction at the Juniata shops. They are used for the heaviest class of high-speed passenger traffic, and have done remarkably good work, even when compared with very large and powerful Pacific type locomotives. In fact they are in many cases pulling trains with greater satisfaction than was previously obtained with locomotives of the Pacific type.

The total weight of the locomotive is 240,000 lb., and the

locomotive, which is entirely dependent on the boiler, has been attained by the care that has been taken in the design of the reciprocating parts to obtain the minimum weight with the great strength required for the amount of power that is transmitted from the large cylinders. The success attained in this particular is indicated by the fact that the weight of the reciprocating parts on each side of the locomotive is less than 1,000 lb.

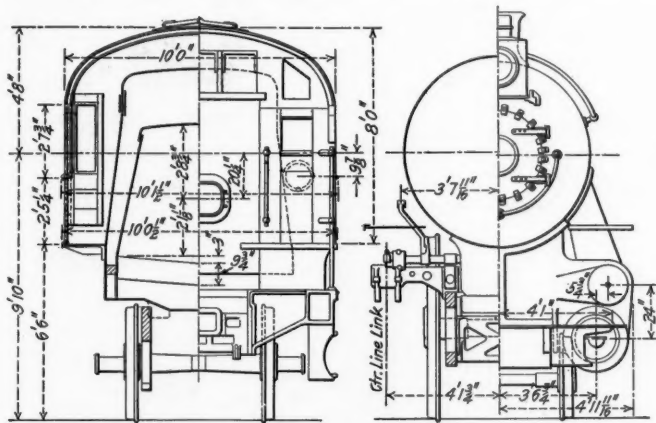
Perhaps the most striking innovation is the method of equalization. The Atlantic type has almost universally been built with an independently equalized front truck, and both pairs of drivers and the trailing truck equalized together on each side.



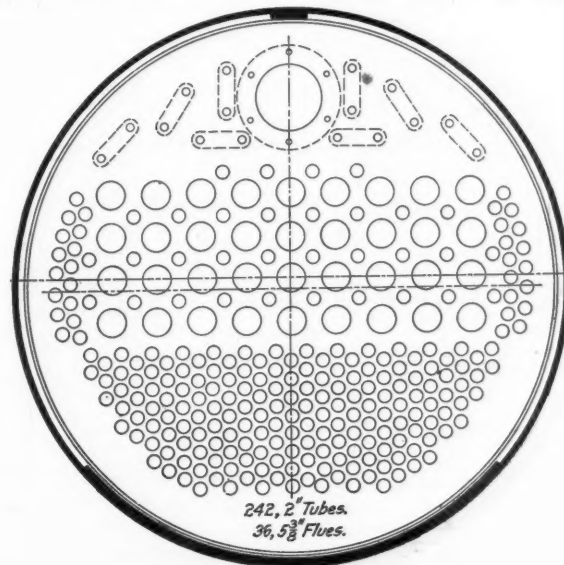
Largest Boiler Ever Applied to an Atlantic Type Locomotive

In this case the front truck is equalized with the front pair of drivers, and the trailing truck with the rear pair of drivers. This gives a condition similar to a two-truck vehicle like a car, and has made a remarkably easy riding machine, which is exceptionally free from destructive action on the track. At the same time the efforts towards good riding qualities have been extended to the tenders, to which an entirely new form of solid frame pedestal type truck has been applied.

Heat treated alloy steel has been freely used throughout the



End Elevations and Sections

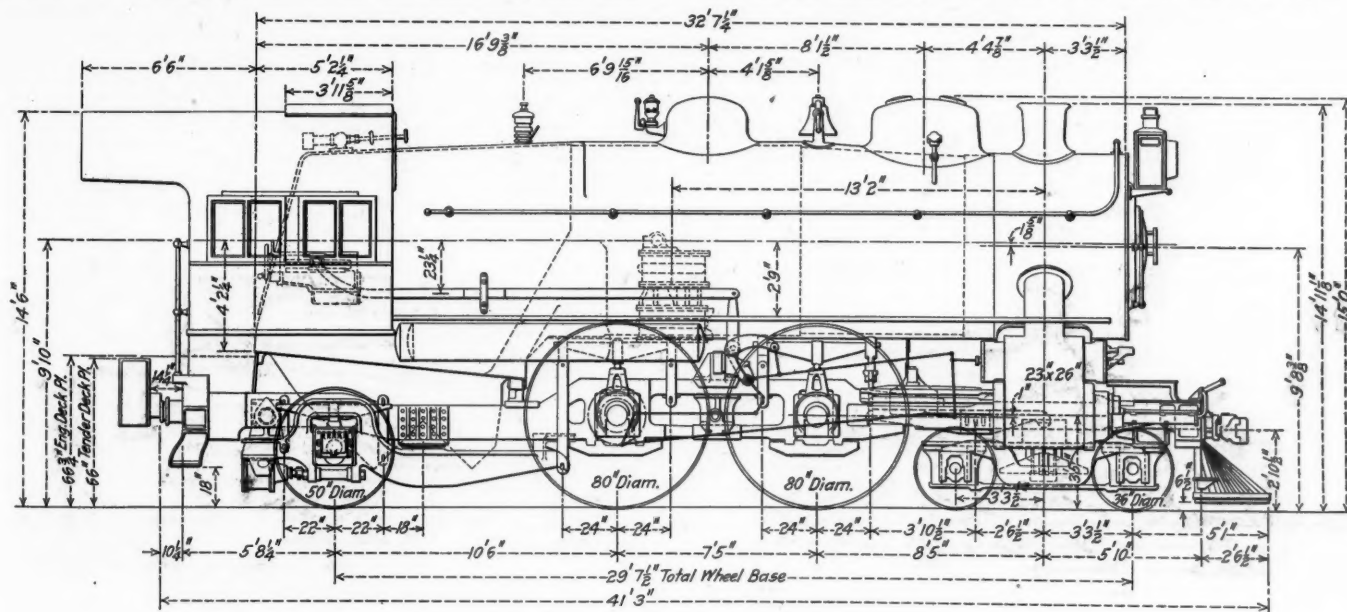


Section Through the Boiler

design, and sections have been adopted which take full advantage of the increased strength of this material.

The boiler is of the Belpaire type, provides a grate area of 55.13 sq. ft., and has a short combustion chamber. The outside diameter is 78 1/2 in. at the front end and 82 1/2 in. at the dome. This has allowed the use of 242 2 in. tubes, and 36 5 3/8 in. superheater flues. A study of some previous tests led to the selection of a length of 15 ft. for the tubes. Beyond such a

leveling. The top of the center plate is hollowed out, and the end of the equalizer has a cylindrical shaped bearing on top of it. The fulcrum of the equalizer is in a very substantial arched casting secured between the frames and having a lip underneath to relieve the heavy bolts of the shearing strain. The weight is thus transferred to the front frame rail immediately back of the cylinders. The remainder of the equalizing system is much the same as that commonly used with a two-wheel engine truck.



Elevation of the Pennsylvania Class E6s Atlantic Type Passenger Locomotive

length, little is gained in increased evaporation, though efficiency will continue to increase. The 15 ft. tubes in the latest boiler increase the ratio of length to diameter from 94 to 103. This somewhat shortens the combustion chamber and gives a heating surface for the tubes of 1,660.5 sq. ft. The boiler is fitted with a brick arch carried on three water tubes, and the grate is sloped toward the front.

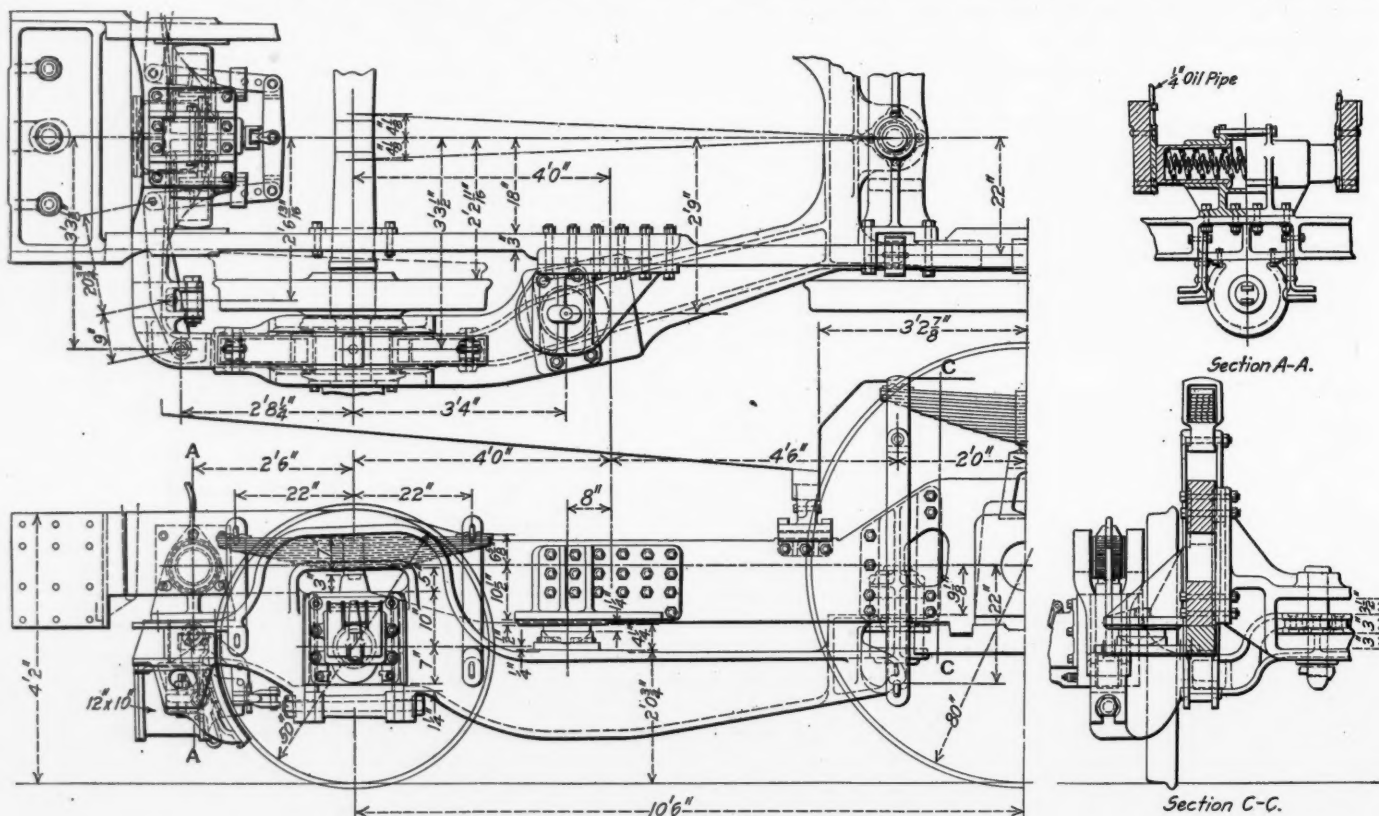
In equalizing the engine truck with the leading drivers the center plate of the truck is carried by heart-shaped hangers in

At the rear, the trailing truck frame itself becomes the equalizer. This frame is a most substantial, carefully designed steel casting, all in one piece. It is hinged to a frame cross brace at the center, but is allowed a 3 in. vertical movement top and bottom on the pin. A combination sliding and ball and socket bearing is located on the bracket extending out from the trailer frame. The spring centering device operates against lubricated plates on the inside of the rear frame. The bearing of the plungers on these plates is small in area, and since they are

properly lubricated, this device will not interfere with the free vertical movement of the combination frame and equalizer.

A very simple design of Walschaert valve gear has followed an exhaustive study of the results of tests and the best construction of various details. The parts have been made as

ered. The rings are joined by phosphor bronze segments, and the piston rod is locked by means of a thin plate washer, the edges of which are turned up. When it is understood that the piston, piston rod and key complete on one side of the engine weigh but 402½ lb., it will be seen that success has been ob-



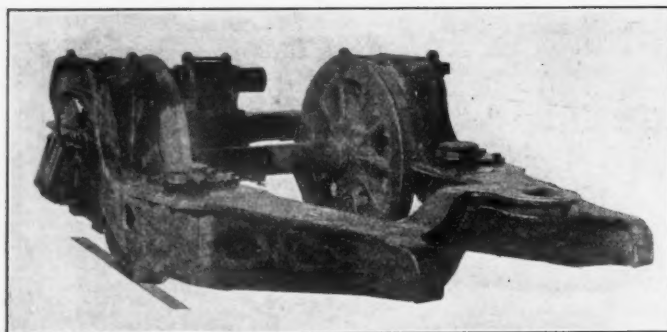
Details of Combination Trailer Truck and Equalizer

light as possible by the use of the best materials. A screw reverse gear is applied.

One of the most interesting details of the locomotives is the piston rod. This is of the extension type, and is hollow and made of heat-treated steel. Much ingenuity was shown in working out the method of producing this unusual form of rod. The rough forging which is drilled for its entire length

tained in the effort towards light weight of reciprocating parts. The same care and study in the design of the crosshead has accomplished equally satisfactory results.

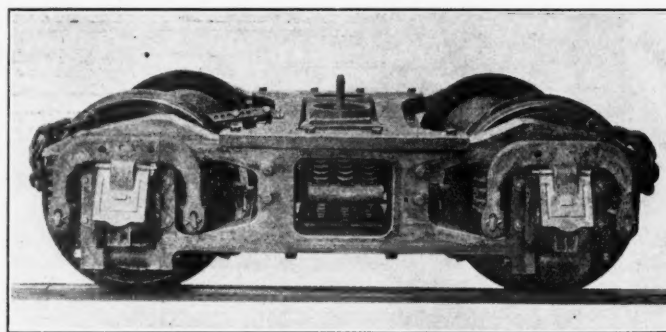
The crank pins are hollow, are of heat-treated carbon steel, and have large bearing surfaces. Heat-treated steel is used for the main and side rods and the axles, as well as the crank pins and other parts of the motion work.



Trailer Truck for the Pennsylvania Locomotive

of over 8½ ft.; the ends of the rod and the piston fit are then pressed down to the smaller diameter in a hydraulic forging press.

The piston is a steel casting with cast iron rings. It is of a Z section and exceptionally light when its diameter is consid-



New Tender Truck on the Pennsylvania Atlantic Type Locomotive

A new form of solid frame pedestal truck has been designed for the tenders of these locomotives. This truck has a most substantial side frame which can be forged or made of a steel casting. A heavy cast steel transom is securely bolted to the frame. Each journal box has two yoke spring hangers sup-

Section Through Hollow, Extended Piston Rod of the Pennsylvania Class E6s Locomotive

porting coil springs, one on either side of the pedestal. The pedestal is provided with a spool binder, and also has removable wearing plates on either side of the jaw. This truck is, of course, considerably heavier than the usual type used under tenders, but its riding qualities are greatly improved and its strength is beyond question.

These locomotives were designed throughout in the mechanical engineer's office at Altoona, and were built at the Juniata shops of the Pennsylvania Railroad.

The general dimensions, weights and ratios are given in the following table:

General Data	
Gage	4 ft. 9 in.
Service	Passenger
Fuel	Bit. coal
Tractive effort	29,427 lb.
Weight in working order	240,000 lb.
Weight on drivers	133,100 lb.
Weight on leading truck	55,000 lb.
Weight on trailing truck	51,900 lb.
Weight of engine and tender in working order	398,000 lb.
Wheel base, driving	7 ft. 5 in.
Wheel base, total	29 ft. 7½ in.
Wheel base, engine and tender	63 ft. 10½ in.
Ratios	
Weight on drivers ÷ tractive effort	4.52
Total weight ÷ tractive effort	8.15
Tractive effort × diam. drivers ÷ heating surface*	599.00
Total heating surface* ÷ grate area	71.30
Firebox heating surface ÷ heating surface*, per cent.	4.93
Weight on drivers ÷ total heating surface*	33.80
Total weight ÷ total heating surface*	61.00
Volume both cylinders, cu. ft.	13.10
Total heating surface* ÷ vol. cylinders	300.00
Grate area ÷ vol. cylinders	4.21

Heating surface, firebox	195.7 sq. ft.
Heating surface, total	2,856.2 sq. ft.
Superheater heating surface	721 sq. ft.
Grate area	55.13 sq. ft.

Tender

Tank	Water bottom
Wheels, diameter	36 in.
Journals, diameter and length	5½ in. × 10 in.
Water capacity	7,000 gals.
Coal capacity	13 tons

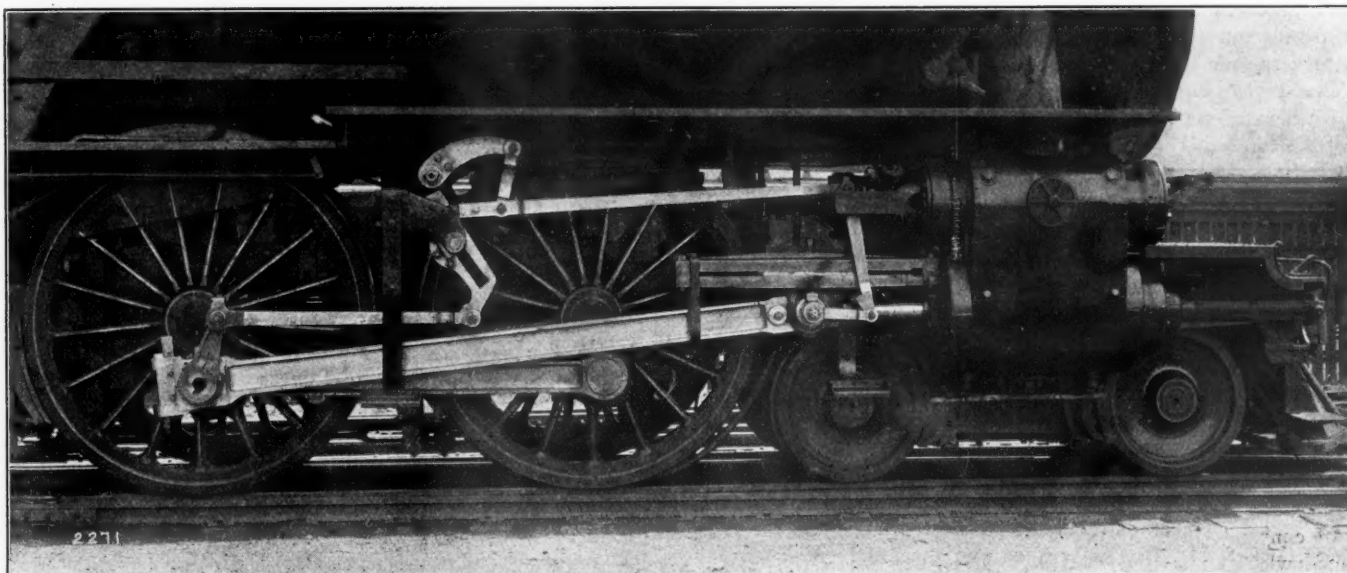
*Equivalent heating surface = 3,937.7 sq. ft.

THE RATE ADVANCE HEARINGS

On February 12, 13 and 14 the Interstate Commerce Commission, represented by Commissioner Harlan, heard testimony and statements in regard to free services performed by railroads and the absorption of terminal and switching charges. Mr. Brandeis presented in the form of a statement, supplemented by witnesses called by the commission and certain witnesses called by the railroad companies in rebuttal, an "incomplete exhibit" showing the present practice in Philadelphia, Chicago and other cities.

The following is a condensed summary of the principal points that Mr. Brandeis made in his statement, no attempt being made to preserve the exact language of the commission's attorney:

In Philadelphia, Baltimore, Pittsburgh, Buffalo, Rochester, Syracuse, Cleveland, Chicago and many other cities railroad companies place cars on private sidings of large shippers free



A Small Crosshead is Used and the Valve Gear is Notable for the Light Weight of the Parts

Cylinders	
Kind	Simple
Diameter and stroke	23½ in. × 26 in.
Valves	
Kind	Piston
Diameter	12 in.
Greatest travel	7 in.
Outside lap	1 5/16 in.
Wheels	
Driving, diameter over tires	80 in.
Driving, thickness of tires	4 in.
Driving journals, main, diameter and length	9½ in. × 13 in.
Engine truck wheels, diameter	36 in.
Engine truck journals	5½ × 10 in.
Trailing truck wheels, diameter	50 in.
Boiler	
Style	Belpaire
Working pressure	205 lb.
Outside diameter of first ring	78½ in.
Firebox, length and width	72 in. × 110½ in.
Firebox plates, thickness	¾ in. & 5/16 in.
Firebox, water space	5 in.
Tubes, number and outside diameter	242—2 in.
Flues, number and outside diameter	36—5¾ in.
Tubes, thickness	¾ in.
Flues, thickness	148 in.
Tubes, length	15 ft.
Heating surface, tubes	2,660.5 sq. ft.

of charge. This in effect amounts to saving the large shipper freight drayage charges from his warehouse to the team tracks of the railroad; and not only is this a saving to the shipper, but it is an additional expense of very considerable proportions to the railroad company. Examiners appointed by the commission have reported the results of their inquiries as to the cost of this service, and from these reports it was found that on 50 cars at Toledo the cost of ferry service supplied by the railroad companies free amounted to 26 per cent. of the total revenue received by the railroad company for the freight so handled. The average cost of ferry service performed free on ten cars by the New York, Chicago & St. Louis at its Stony Island station in Chicago amounted to 49 per cent. of the total revenue received by this railroad company as its proportion of the entire freight rate on the commodities carried in these 10 cars. It was found in some instances that the cost of ferry service was greater than the total revenue received on this freight by the railroad performing the ferry service free. One instance was cited in which the ferry service on the Michigan Central cost an amount equal

to 164 per cent. of the total revenue received by the Michigan Central as its proportion of the freight rate on the commodities carried in a certain car.

The service performed by the tunnel company in Chicago on L. C. L. freight, the cost of which is absorbed by the railroad companies, is apparently analogous to that of free ferry service, in that it is an additional expense to the railroad company and amounts to a discrimination against shippers who are not situated on the tunnel company's lines. The lighterage service performed in Chicago is also analogous to the free ferry service and the tunnel service. This lighterage system applies also to all carload shipments going from or to Chicago river landings; it costs the railroad company about three cents per 100 lb.

Spotting of cars on private sidings is a switching service the cost of which constitutes an appreciable part of the total operating expenses of railroads. Reference is made to the facts brought out in the recently decided case of allowances to industrial companies, and the prevailing cost of the switching service involved in spotting cars is estimated to run between \$2 and \$4 a car. The number of cars spotted on spur tracks for industries by the Boston & Maine was 710,000 in one year, and it was estimated that a \$2 spotting charge per car would have yielded as much additional revenue to the railroad as an increase of 5 per cent. in its total freight charges.

Railroads in certain cities are also assuming the burden of loading and unloading cars; and where, as, for instance, at Yonkers, the shipper performs this service, he is sometimes paid a certain amount by the railroad company. Investigation of other practices in regard to shipments of sugar indicated that sugar was billed at an estimated weight of from 8 to 9 lb. per barrel less than the actual weight.

The services such as are performed by the union stock yards at Chicago of weighing at the stock yards are paid for by the railroad company, but the charge is absorbed in the freight rate. The cost of this service amounted to nearly 45 per cent. of the total freight revenue on 25 cars selected by the commission's examiners at random.

The commission's examiners found instances of exceptions that are being made to the enforcement of a uniform demurrage rule. For instance, in New York City freight arriving lighterage free at the Sixtieth street station of the New York Central is allowed ten days' free time. In addition, the railroad finds it necessary in order to release its equipment within ten days to unload the cars at the railroad company's expense.

The following witnesses were called during Mr. Brandeis' above recital:

H. C. Barlow, director of the Chicago Association of Commerce and a member of the joint committee which framed the Lowry tariffs. Mr. Barlow testified that the Lowry tariffs were the result of congestion due to inadequate team tracks and refused to acknowledge that the switching service in the Chicago switching district was a free service, claiming that it was merely part of the necessary service of transportation into and out of Chicago. He claimed that shippers load and unload L. C. L. freight at Chicago, which service the railroads ought properly to perform themselves.

Frederick Zimmerman was called upon to describe in detail the services performed at Chicago by the lighterage, tunnel, car float and other terminal companies, and he was asked to furnish the commission with a list of the industries which received such service free of charge.

J. G. Rogers, superintendent of terminal delivery in Philadelphia, was asked to testify regarding the cost of placing cars on private sidings. He said that in October, 1913, about 15,600 cars were placed on private tracks. In his opinion it sometimes cost more and sometimes cost less to place a car on a private track than to place it on team tracks. He estimated that it cost about \$3.10 to \$3.82 per car for transportation expenses directly assignable to switch engine service for cars placed on private sidings.

George M. Shriver, second vice-president of the Baltimore & Ohio, estimated that the transportation cost directly assignable to switch engine service per car placed on private sidings in Bal-

timore was about \$3.40. In October, 1913, there were 4,826 cars set on private tracks in Baltimore. He estimated that the Baltimore & Ohio could place ten cars on a team track at about the same cost as setting one on a private track.

W. A. Sheaffer, freight trainmaster of the Pennsylvania at Altoona, described the methods of handling coke cars at Altoona, testifying that they were handled by road engines with certain exceptions. At the Frick Coal Company plants the company uses its own shifter engine for convenience, and at another point a shifter engine and not a road engine is used because of the very sharp curves. Coke is never delivered to team tracks in Altoona, and of the total delivery of coke cars, 99 per cent. of the work of placing them on gravity tracks is done by the road crews.

W. H. Heath, of Larkin & Co., Buffalo, N. Y., described the practice in regard to placing the cars on the side tracks adjacent to the large terminal building recently built by his company at Buffalo. This building cost, Mr. Heath said, in the neighborhood of \$1,000,000, and he ascribed the reason for building a terminal of this kind to the lack of facilities of the railroad companies. He made the point that by relieving these facilities of the Larkin business the Larkin company had performed a service to other shippers in Buffalo.

The Interstate Commerce Commission has further suspended until September 12 the general 5 per cent. advance in freight rates, application for which was filed by the fifty-seven railroads in official classification territory. The announcement was followed by depression in railroad stocks on the New York Stock Exchange. At the office of the commission it was said that the order did not mean that the commission would defer its decision until September 12.

DON'TS FOR OFFICERS

Many railways have sent broadcast among their employees long lists of "Don'ts" for their guidance. C. E. Carson, superintendent of the Ft. Dodge, Des Moines & Southern, has compiled the following list of "Don'ts" for officers, which apply not only to railway men but to men in authority in other lines.

"Don't nag. Many a good man has been nagged into inefficiency.

"Don't humiliate a man by advertising his shortcomings from the housetops, but quietly point them out to him. He will lose an arm for you.

"Don't treat your men as if they belonged to the kindergarten class. Chances are they are better posted than you are.

"Don't be afraid to compliment an employee for some commendable service. He is made of precisely the same kind of stuff that you are.

"Don't forget that if the subordinate had as much gray matter as you have, he might be holding your job. Try to be bigger than any man on your payroll.

"Don't forget that where some of your men are making mistakes that cost dollars, you, by pursuing a mistaken policy, are costing the company thousands.

"Don't forget that a man who is made out of the right kind of stuff will resent a brutal call-down, and you should not complain if he knocks you down.

"Don't forget that a man who will stand for a 'cussing' because of some mistake or oversight is not the kind of a man who is able to help your administration. He should be fired.

"Don't forget that the whole industrial world has changed since you had your ear close to the earth and that what might have been done 25 years ago would be impossible now.

"Don't forget that while you are checking everybody else up it might be a good thing for the company you represent to make a careful inventory of yourself. You may be 25 years behind the times.

"Finally: Let each action be sweetened by a little of the milk of human kindness. It will cause you to have pleasant recollections after you have been laid on the shelf and enable you to look your old associates in the eyes."

The Pennsylvania Railroad's Safety Campaign

Comprehensive Statement Regarding Means Used to Reduce Accidents of All Kinds and Results Secured

Probably no railway management in the country has adopted more comprehensive and detailed methods for making its operations safe than that of the Pennsylvania Railroad System. The management recently has issued a bulletin describing the methods used to promote safety on the lines of the Pennsylvania Railroad proper—in other words, that part of the system east of Erie and Pittsburgh. The information given out is so complete and illustrates at the same time so strikingly the efforts that can be made along this line and are made by the management of a large railroad that it is published practically in full below:

Not a single passenger out of 111,000,000 carried by the Pennsylvania Railroad Company in 1913 was killed in a train accident.

Reports for the past six years show that almost 600,000,000 passengers—a number equal to more than one-third of the whole world's population—have been carried by the Pennsylvania Railroad, and but sixteen of them lost their lives in accidents to trains; nine were killed in one accident. In six years, out of approximately 5,000,000 trains operated—about 2,280 a day—only five have suffered wrecks which caused the death of any of the passengers carried on them. Three of these years were entirely free from train accidents causing the death of passengers.

The Pennsylvania management regards every accident of any kind on its property as one too many. Every effort is being continually directed to the end that the number of accidents of all kinds may be steadily reduced, and if possible prevented.

WHAT PRODUCES SAFETY

Safety in railroad operation is the result of:

Properly constructed and maintained track, signals, rolling stock, shops, buildings, etc.;

Rules and regulations carefully conceived and thoroughly applied; and

Employees, carefully selected and trained, loyally performing their duties under intelligent and comprehensive supervision.

The foregoing, of course, are measures of perfection. But they also state the policy of the Pennsylvania Railroad—a policy not completely realized, yet constantly in mind and underlying all the efforts, necessarily imperfect, of the management.

The Pennsylvania management accepts its responsibility not only to make every effort to avoid accidents to trains, but, as far as possible, to save others from the logical results of their own faults. The results of these policies may be set forth as follows:

CONSTRUCTION AND MAINTENANCE

Track.—The Pennsylvania is for the most part a multiple track system running through the most congested district in the United States. The roadbed is of the highest standard. The main lines are laid entirely with stone ballast. The company paid \$2,095 per mile last year to maintain 12,766 miles of track. This was as compared with an average of \$1,553 for all the railroads in the territory east of the Mississippi and north of the Ohio rivers. The rail of main lines is of 100 lb. section; no lighter rail is bought. During the calendar year 1912, 75,542 tons of 100-lb. rail were used in renewal and repairs. More than 34,000 men are employed in the maintenance of way department—nearly seven men per mile of line, thus insuring a high standard of maintenance.

From a safety standpoint, nothing that the Pennsylvania Railroad has done has been of more far-reaching importance than the investigations it has made in the development of rail sections and specifications. The mere fact that the rail orders of this company for delivery in 1912 and 1913 amounted to

333,800 tons indicates the necessity for the most rigid supervision of steel rail manufacture and performance.

The methods employed by the Pennsylvania Railroad in the inspection of steel rails before they are laid in the track have been made even more stringent in the past few years. While a rail is being rolled it is carefully inspected by a representative of the company, and one rail out of every heat rolled is tested for the interior fabric of the steel.

A comprehensive system of blanks and reports has been devised whereby the history of each rail is recorded. One series of blanks covers information obtained at the mill during manufacture. A second series relates to rail failures in main track. The company keeps a complete history of every rail purchased, and is thus able to classify failures and more carefully guard against repetition.

After a rail is placed in the track, a special guardian, the track-walker, is placed over it. There are 600 track-walkers employed by the Pennsylvania Railroad. They patrol the passenger tracks day and night to see that all rails, nuts, bolts and cross-ties are in good order. A track-walker's route is usually about four miles long, but is even less on those stretches of track where special watchfulness is needed. Every track-walker carries a time clock, which records his movements over the railroad committed to his care.

Much progress was made last year in increasing the number of cross-ties per 33 ft. rail, to give the track more strength and make it safer. From having 16 ties per rail three years ago, the standard has been changed to 18, while on main lines 20 ties per rail are being installed.

Bridges.—Further to insure against bridge failures, the Pennsylvania has revised its method of bridge inspection so as to provide for the inspecting in greater detail than had been done before. The practice adopted requires division bridge inspectors (there are 48 in all) to inspect bridges monthly, and the division engineer, together with the master carpenter, must inspect them semi-annually; in addition, the latter two accompany the engineer of maintenance of way on his inspections. The division engineer and the master carpenter now devote about three weeks annually to this work as compared with a few days under the previous method.

In addition to the above inspection, there is a further inspection made by three men of practical and theoretical experience. They were appointed January 1, 1913, and their duty is to make detailed inspections of all bridges on the Pennsylvania Railroad. Prior to their appointment as bridge inspectors these men had experience in both bridge designing and construction.

While making increasingly rigid its bridge inspection, the Pennsylvania is rapidly replacing steel bridges with those of stone and concrete construction. Some notable examples of bridge construction of this kind which have either just been completed or are now being built are the bridges over Bush and Gunpowder rivers, near Baltimore; the five-track bridge over the Schuylkill river at Girard avenue, Philadelphia; the concrete bridge over North Broad street at North Philadelphia station, and the concrete arch bridge at Rahway, N. J. In addition to these large bridges, the company is rapidly replacing the small steel structures with concrete arches.

Block Signals.—While the use of block signals had been very general for many years, on and after January 1, 1913, all passenger traffic, on main lines and branches, or, in other words, 100 per cent. of the Pennsylvania's passenger traffic, was handled under absolute or automatic block signal system. Forty per cent. of all freight and passenger mileage is handled under automatic signals. During the six months ending December 31, 1912, ap-

proximately 345 miles of road were equipped with block signals, making a total of 4,948 miles of line out of a total of 5,333 now operated under block signal system. The design of the management is to have the entire main line between New York and Pittsburgh and Philadelphia and Washington protected by automatic block. On a four-track railroad such installation costs from \$6,000 to \$15,000 per mile, according to the system used. The board of directors have authorized the expenditure sufficient to install automatic signals on the entire main line as rapidly as possible, and the work is entirely completed with the exception of 70 miles, which will be finished by June of 1914.

Interlocking Plants.—There are 468 interlocking plants on the Lines East. Exclusive of terminal plants, there are 474 turnouts and crossovers used by passenger trains. On July 1, 1911, only 156 of these were what are called No. 20's—a long, easy crossover at a 1 deg. 40 min. curve. Since July 1, 1911, 48 turnouts have been removed or changed to No. 20's, 86 changes to 20's have been authorized, and 113 changes are now under consideration. On account of local conditions 71 crossovers will not be changed. Since October 1, 1912, \$6,500,000 has been authorized for changes in interlocking plants and signal work, and with every change made, short, sharp crossovers are replaced by long, easy ones. Today high-speed passenger trains between New York and Pittsburgh and Philadelphia and Washington are, under normal operation, governed by signals, and when diverted are moved over long, easy crossovers and turnouts.

Highway Grade Crossing Gates and Signals.—During the last ten years, 430 grade crossings have been eliminated at a cost of \$27,742,433.06. There were 55 grade crossings in process of removal in 1913. It is the policy of the company to undertake no new work on which there will be grade crossings. On June 1, 1913, the Pennsylvania Railroad had 1,089 crossing watchmen. Highway crossing gates and signals are extensively provided all over the road.

Passenger Cars.—The Pennsylvania Railroad System has on its lines 1,613 all-steel passenger cars; this includes about 50 per cent. of the entire steel passenger carrying equipment on the steam railroads of the United States. In addition, 378 all-steel cars are now under construction.

The Pennsylvania Railroad was a pioneer in the introduction of steel cars, both passenger and freight. In 1906 it adopted as standard the all-steel fireproof construction of all the various classes of cars used in its passenger trains. Since that date it has built nothing but steel cars.

In addition to its own steel passenger equipment, all of the Pullman cars (about 770) operating over the Pennsylvania System Lines East and West of Pittsburgh are of steel construction. More than 40 per cent. of all the steel Pullman equipment in service in the United States is in use on the Pennsylvania Railroad.

Freight Cars.—This company has 66,676 all-steel freight cars, 52,097 steel underframe freight cars, and 48,510 wooden cars, a total of 167,283 cars.

During the year 1913 over 10,000 steel and steel underframe freight cars were placed in service, and there are now over 7,000 such cars under construction and being delivered.

The company keeps a history of every car wheel and axle. It is thus able to trace every failure, and to prevent a repetition of a similar accident in the same set originally ordered.

Of these 17,000 cars, 6,000 are to replace wooden cars taken out of service. During a recent month, 1,600 wooden cars were taken out of service and destroyed.

To maintain its rolling stock in a high state of efficiency the Pennsylvania Railroad employs 41,000 men in its shops and roundhouses. Failures of rolling stock in transit constitute a great menace, and it is only by means of careful and adequate inspection that this danger is guarded against; hence, approximately \$2,000,000 was spent during the year ended June 30, 1913, for inspection.

Safety Devices in Shops.—In September, 1910, the Pennsylvania Railroad employed the experts of one of the large accident liability insurance companies to make a thorough inspection

of each shop plant. In consequence, it was deemed advisable to make the work of safety inspection a permanent feature and organize a safety movement to cover road and yard as well as shop conditions over the entire system.

Safety committees were appointed in January, 1911, for each superintendent's division, and for each shop for repairing engines and cars. On the larger divisions a special shop safety committee was named in addition to the road and yard committees. There are thirty-five committees with an average of five men on a committee, each department being represented. These committees have made 17,333 formal recommendations, 13,861 having been complied with at a cost of \$413,525.23. During the six months ended June 30, 1913, 3,209 safety recommendations were made, 2,390 being complied with at a cost of \$75,361.97.

In addition to the divisional safety committees, a mechanical engineer was engaged for the specific purpose of making inspections at the various shops. During the year ended June 30, 1913, fifty-eight general inspections and fifteen special inspections were made. Usually the first inspection results in attention being called to all hazards and the following inspections are made to see that the recommendations for the installation of safety devices are complied with.

In order to make inspection even more effective, an additional inspector has been appointed to supervise road and yard conditions; both inspectors devote their entire time to safety work.

EDUCATING EMPLOYEES CONCERNING SAFETY

On May 1, 1913, as a means of educating employees, a pamphlet entitled "Safety Hints and Suggestions for the Prevention of Personal Injury Accidents" was issued. The instructions contained in this book are based on the combined recommendations of the safety committees, being supplemented by suggestions from the best experts in the country on mechanical and civil engineering and train operation. This pamphlet is practically a text-book on safety. As a guide to safety committees, it has proven most useful; over 120,000 copies have been distributed.

As part of the safety first campaign, the Manhattan Division Committee at New York has recently organized an exceptionally interesting and effective safety first exposition, held in the Y. M. C. A. quarters in the Pennsylvania station, New York, September 26. On that day 2,600 men visited the exposition, and so many others wanted to attend that it was necessary to continue it for a week; during that time there were 4,000 visitors, mostly employees.

Probably nothing has aided the safety movement more than the Safety First meetings, which are being held continually at all important points on the system. These are illustrated by stereopticon views and motion pictures.

Knowing that ignorance of the English language is oftentimes the cause of accident, the railroad now conducts a course of instruction in English for Italian laborers.

RESULTS IN SHOPS

One of the results of all this detailed attention to safety is that \$99,753 has been spent for safety guards—mainly in shops. Practically all machines and dangerous conditions are now guarded. But the real result is that serious accidents to shop employees have been reduced from 5.4 per 1,000 employees in 1911 to 3.2 in 1912. In 35 out of 46 shops, where more than 500 men are employed, the number of serious accidents per one thousand men has been reduced from 5 to 70 per cent. One of the results of the original attention to the subject, and the keeping of detailed statistics, is that when one shop does not show a satisfactory improvement, special inquiry is made with a view always to improving conditions.

Installation of Hospitals, Hospital Cars and Emergency Hospitals to Alleviate Injuries and Save Life.—All along the line of the Pennsylvania Railroad public hospitals are located at convenient distances to the railroad. It has not, therefore, been necessary to provide private hospitals, but the company contributes to the operation of many such institutions.

Provision for Emergency Relief.—Thirty medical examiners'

offices are located at different points, and these are all fitted up to do emergency surgical work. A chief medical examiner and thirty-nine assistant medical examiners, all graduate physicians, conduct this emergency work.

The medical examiners and assistants give instructions to all employees in "First Aid" to the injured and instructions on resuscitation from electrical shock. For the year ended August 31, 1913, one hundred and ninety-five lectures were given to employees at different places, particularly at the larger shops. Emergency hospitals are located at most of the important shops, especially those located at outlying points. They are in charge of employees who are familiar with "First-Aid Work," as taught by the Red Cross Society. In addition to the doctors employed, the company retains three hundred and forty surgeons who are available for any emergency.

All stations, shops, engine cabs, cabooses, etc., are equipped with "First Aid" kits containing all necessary material for immediate treatment.

RULES, SUPERVISION AND EFFICIENCY

The Pennsylvania Railroad is operated under the most approved rules known to the railroad art. It is the thoroughness with which the rules are carried out, however, which supplies the criterion by which operations should be judged. The divisional system of operation is used on this railroad—to place responsibility as far as possible upon the division superintendent, the man on the ground. Division superintendents scrutinize carefully the actions of all men under them. As a means of ascertaining the alertness of the men and the care with which the rules are obeyed, frequent efficiency tests (sometimes called "surprise" tests) are made. From an unpopular innovation, it is now becoming recognized that such tests are an absolute necessity for safe operation.

Efficiency Tests.—Records of tests made during the year ending June 30, 1913, give an excellent indication of the hearty support the employees are giving the management. Of all the 4,478,135 tests and observation reports, 99.8 per cent. showed perfect compliance with all rules. This is particularly gratifying when it is remembered that almost all the recent serious train accidents in the United States have been due to violation of rules. Violations of rules and regulations discovered by efficiency tests are treated in the same manner as if accidents resulted.

It is a fact worthy of mention, that practically every man in the train service who has been found violating signal or flagging rules since 1909 has had his attention called to it in a special way and warned.

It is in the use of the track and the rolling stock that the human equation enters, necessitating rules and regulations and the careful interpretation and observance thereof. This feature is covered by the regular divisional organizations, but the management, in its determination to see that the highest standard of safety in operation is reached and maintained, has instituted two committees as part of the permanent organization known as the despatching committee and the discipline committee, respectively.

The General Manager's Despatching Committee.—This is composed of five operating officials. It is the duty of this committee to learn that the rules and regulations in effect on each division and on every part of each division are in accordance with the authorized standards. Thorough investigation is made to learn whether the rules are applied, interpreted and obeyed as prescribed. Every division of the road has been canvassed by this committee and since its inception, in 1908, it has been constantly active.

General Manager's Discipline Committee.—This is composed of three division officers. The function of this committee consists in making detailed examinations of individual discipline records, methods of administration of discipline and keeping records. Full and complete reports are made on the results of the examination to the general manager, who requires proper

action on the recommendations. They call attention to the cases of men whose records indicate that they are below a reasonable standard of efficiency, especial attention being paid to violations of safety rules and regulations.

The discipline committee was organized in January, 1911. The following original instructions were received by the general manager from the president:

"To have the records of all our enginemen gone over with the view of judging whether the records indicate a rather unsafe man, and those who are found to be doubtful either moved to a less important run or notified unless thereafter their record was improved they would be transferred."

The examination of the records of the enginemen, 5,607 all told, has been completed during the past year, a report having been made for each division separately, and every engineman in the service whose record did not come up to a reasonable standard was called to account by the official in charge. As soon as the enginemen were covered, the committee began with the records of all other employees.

Temperance.—The Pennsylvania Railroad's rules on the subject of temperance are simple but positive. More men have been discharged or demoted on account of their personal habits during the past year than in any other similar period of the company's history. This is not because drunkenness and immorality are increasing, but it is the result of very careful supervision. Men not only must not come on duty under the influence of alcohol, but the frequenting of saloons is regarded as a fit subject for inquiry and discipline.

The management also recognizes its obligation—having forbidden the men to frequent saloons—to provide opportunities for healthy recreation. It can fairly be claimed, therefore, that an element of safety insurance is to be found in such provision.

OPPORTUNITIES FOR RECREATION

Grounds for outdoor recreation have been provided for employees as follows:

New Jersey Division—

Woodside: Two tennis courts and a baseball field.

South Amboy: Tennis court, baseball and running track.

Trenton: Quoits.

Camden: Quoits.

Eastern Pennsylvania Division—

Cresson: Field for baseball and tennis (previous to this year).

Tyrone: Field for baseball, tennis and running track (previous to this year).

Reading: Tennis court and baseball field.

Altoona machine shop, East Altoona, Juniata shop and South Altoona, respectively: For baseball.

Enola: Tennis court and baseball field.

Columbia: Baseball field and tennis court on rented ground.

Western Pennsylvania Division—

Pitcairn: Grounds for baseball, croquet, tennis and basketball (previous to this year).

The baseball field was fitted up this year with swings, seesaws, etc., for use as a children's playground, and a band stand was erected, where concerts are given by a band composed of Pitcairn shopmen for the benefit of employees and families.

South Fork: For baseball.

East Liberty: For baseball and tennis.

Freeport, Aspinwall and Verona: For baseball.

Elrama, West Brownsville and Southside, Pittsburgh: For baseball, tennis, quoits, etc.

Bellwood: Tennis court and baseball field on rented ground.

Gallitzin: Tennis court.

Conemaugh: Tennis court, baseball field and quoits.

Derry: Recreation park, with facilities for tennis, baseball and quoits.

Youngwood: Baseball field, tennis court and quoits.

Blairsville: Baseball field.

Pittsburgh, Forty-third street: Tennis court.

Erie Division and Northern Central Railway—

Bachman: Baseball field on public grounds.

Renovo: For baseball, tennis, handball and playgrounds for children, with swings, slides, see-saws, horizontal bars, traveling rings, etc., and a running track.

Northern Division—

Olean: For baseball.

Foxburg: For baseball, quoits and volley ball.

In Contemplation—

Harrison: An athletic field.

Summit avenue: Tennis court.

Norristown, Franklin avenue: An athletic field for baseball, tennis, etc.

Altoona: On the old cricket grounds, where there is already a baseball diamond used by the various clubs, an appropriation has been made for improving the clubhouse and putting in lockers, showers, etc.

It is the company's policy to encourage outdoor sports of the employees generally by making reasonable appropriations to that end.

Indoor sports and recreation are also encouraged, but this is done for the most part through the railroad Y. M. C. A. The facilities consist of gymnasium, swimming pools, bowling alleys, pool, billiards, shuffleboard and reading rooms. The company in 1913 has contributed \$105,454 to the support of the twenty-six P. R. R. branches of the Y. M. C. A.

The company also provides rest rooms where needed, and at a number of places has established lunch counters.

EMPLOYMENT AND TRAINING OF MEN

The Pennsylvania Railroad is extremely careful in the employment of new men. Employment on this railroad is regarded as continuous, and increasing vigilance is constantly manifested to keep recruits up to a high standard. In the case of the majority of the skilled workmen employed, the only qualifications demanded, other than those required of the ordinary recruit, are that the applicants be skilled in the trade in which they are seeking employment. All men are required to pass a severe physical examination, including tests in vision, color perception and hearing, and must be of good moral character.

Applicants for positions in train service are required to pass satisfactorily an examination in arithmetic up to and including long division, and to be able to read and write English. They are also required to pass a physical examination, as well as an examination in vision, color perception and hearing.

During the past year a committee has re-canvassed the entire subject of methods of employing new men, and that committee made the following recommendations, which have already been adopted on one of the largest of the company's grand divisions:

RULES TO GOVERN EMPLOYMENT OF NEW MEN.

"1. Employing officers should personally interview all applicants for employment. This may make necessary the assignment of certain hours during the day during which applications will be received. In the case of desirable men applying for positions at times when no local vacancies exist, such information should be recorded concerning them as will make it possible to locate the men when needed. This information should be forwarded through the regular channel to the General Superintendent.

"2. The standard of education as at present required of men entering train service should be raised to include a knowledge of fractions and decimals. This advanced standard test should also be applied to men seeking employment in other lines of work above the grade of unskilled laborer, or semi-skilled shopmen, and to such junior employees as apprentices, messengers and clerks. In addition, a serious effort should be made to recruit the forces of semi-skilled shopmen from a class qualified to pass a test of this kind.

"3. The previous service records of new employees above the grade of unskilled laborer should be carefully investigated by correspondence, using for the purpose form C. T. 1396, accompanied by a typewritten letter over the Superintendent's signature. When necessary, this method may be supplemented by police department action.

"4. New employees, whose duties pertain to the movement of traffic, governing which certain rules and regulations have been formulated, should be given progressive instruction and examination in these important matters to insure a thorough understanding thereof by these men. The functions of the present efficiency committees, divisional instructors, etc., should be extended to include this work.

"5. A representative of the General Superintendent should be designated to supervise in a general way the educational work of the divisional organizations and to co-operate with the various employing officers through their respective Superintendents to the end that maximum use may be made of the labor supply tributary to the Grand Division, and prompt and effective measures taken to relieve local shortages. It should also be the duty of this representative to co-operate with the public schools in order that an increasing number of better-trained men may be attracted to the railroad service. When necessary, such special assistance as might be required to carry out this work might be temporarily furnished."

CONTROL OF COMMUNICABLE DISEASES AND GENERAL SANITARY MEASURES.

The control of communicable diseases and the general sanitary measures for employees and passengers have for a long time been given careful attention. During the past year modern toilet and lavatory facilities have been installed at a number of shop plants, including West Philadelphia, Trenton, Altoona and Pitcairn, and at various other points. Water coolers and cups have been replaced by bubble fountains, and the roller towel abolished.

The standard of cleanliness at Pennsylvania stations and on cars is of a high order. House cleaning on a railroad is a continuous performance. In the Pennsylvania's Yards at Sunnyside, Long Island, for example, over eleven thousand cars are cleaned every month—more than 350 a day—and only the cars on long-distance trains and dining cars are handled here.

Some fourteen hundred car cleaners are employed at different points, exclusive of those employed by the Pullman Company. The Pullman Company cleans its own cars under the railroad's supervision. All passenger cars in which persons known to have contagious diseases have been carried are immediately fumigated.

PHYSICAL EXAMINATION OF DINING CAR EMPLOYEES.

Of very great importance was the establishment early in January, 1913, of a rule debarring from employment in the company's dining car and restaurant service any person with even a tendency toward communicable disease.

It was at first planned to have a physical examination of all such employees every three months, but the examination was recently ordered to be held every thirty days.

These examinations cover every employee who has anything whatsoever to do with the preparation or serving of food. Dishwashers, kitchen helpers, cooks and waiters, both white and colored, must undergo a rigid examination, and only a 100 per cent. report on their physical condition will permit their remaining in the service.

If a Pennsylvania Railroad dining car or restaurant employee becomes disabled through any cause, he is not permitted to return to work until he receives a "Certificate of Ability" from one of the company's doctors.

In order to surround the service with every possible precaution, there are provided at "lay-over points" for dining car stewards, waiters and cooks, special lodgings with clean linens, clean beds, and every sanitary protection.

As a means of impressing employees with the reasons for the various processes of cleaning cars and stations, a pamphlet entitled "Sanitation of Freight and Passenger Stations," written by one of the company's doctors, has been distributed to those concerned.

ACCIDENT BUREAU.

In a great organization, with more than 150,000 employees, it is obvious that only by most exact statistics and study of typical conditions can comprehensive provision be made to remove the

causes of accident. It is not enough to ascertain that an accident was due to a collision. Why this collision? It is primary causes—tendencies—that must be studied and removed.

With such a comprehensive purpose in view the management of the Pennsylvania Railroad has established an accident bureau. Beginning in 1911 a report of every personal injury, no matter how slight, was required. These reports are carefully scrutinized and embodied in statistics which have enabled the management to suggest remedial measures. This is how it has worked out:

It was shown that fatal injuries to trackmen were comparatively numerous. The number killed and injured each quarter was used as subject-matter in a campaign for prevention. Result: Eleven less killed in the quarter ended June 30, 1913, as compared with the same quarter, 1912. Being caught between cars was shown to be the cause of a great many accidents. As a result of the use of the statistics there was a reduction under this cause of five killed and forty-seven injured in the quarter ended June 30, 1913, as compared with the preceding quarter of 1913.

A detailed report of every derailment and collision of cars, engines or trains, regardless of cost or damage or where occurring, is required. These reports are carefully supervised to determine the cause and place responsibility, and are embodied in a statement of main track, yard and siding derailments and collisions. The statement is arranged to show the responsibility of each department. It is classified under thirty-eight causes for each division. This form of statement, which has been very useful in suggesting remedial measures, was developed in the year ended June 30, 1913.

REDUCTION OF TRESPASSING

The necessity for adequate police protection on a railroad is imperative. Train accidents resulting from malicious obstruction or other criminal activities constitute a serious menace. The activities of the police department during the past year are shown in the following statistics:

Number of arrests made.....	11,434
Number of convictions.....	10,014
Number of trespassers arrested (included in above).....	4,275
Number of trespassers convicted.....	3,649
Number of illegal train riders arrested (included in above).....	2,775
Number of illegal train riders convicted.....	2,587
It is estimated that the number of persons warned to keep off of the track by the Police Department amounted to.....	5,000

There were twenty arrests for depredations, involving the safety of trains. It cost approximately \$800,000 to maintain and carry on the work of the police department during the year. The following statement shows the reduction in trespassers killed, principally due to the activities of the police department:

NUMBER OF TRESPASSERS KILLED ON THE LINES EAST OF PITTSBURGH AND ERIE, FOR THE YEARS 1907-1913 INCLUSIVE.

1907.....	572
1908.....	475
1909.....	410
1910.....	336
1911.....	338
1912.....	255
1913.....	303

Thus, in spite of the increased traffic, 317 fewer men were killed trespassing in 1912 than in 1907—a reduction of 55 per cent. Last year showed a reduction of 47 per cent. over 1907.

EDUCATING THE PUBLIC

It is evident that the preponderance of railroad fatalities is due to causes over which the railroad company has but little control. It is believed, however, that the most efficacious plan of removing these exterior causes is through appeal to popular intelligence and sentiment. With this end in view the management of the Pennsylvania Railroad has, upon every occasion, given to the public any information or suggestion in its possession as to the causes of accidents or how they could be eliminated. Of such a character were statements concerning the danger from tight skirts; articles reprinted concerning trespassing and its evils; a poster placed on all the company's station bulletin boards concerning grade crossings; two pamphlets entitled "The Struggle to Make This Railroad Safe" and "Campaigning for 'Safety First.'"

STATE RAILWAY OPERATION IN WESTERN AUSTRALIA*

By FRANCIS A. BONNER

Associate Director, Bureau of Railway News and Statistics.

Not far from directly beneath our feet on the nether side of earth works a government railway system exceeding slightly in length the Pere Marquette, but falling short in width. It cost some \$25,000 per mile to build, which is pretty cheap. On the other hand it is entirely narrow gage; its steep grades run up hill and down dale like a trolley line; its tiny sleepers carry 45 to 60-lb. rail, and of ballast it boasts little. The maximum speed limit on some important portions is fifteen miles per hour. It is known as the Government Railways of Western Australia.

Ability or inability of one government of English stock to manage successfully a system of this size argues nothing, of course, for or against ability of another nation of kindred stock to operate successfully one of 90 times the mileage and 300 times the traffic, such as our own. Yet certain defects often are said to be inherent in public operations of this character. One is subservience to the labor vote as a matter of policy through advances in wages; the other subservience to the shipping and traveling vote as a matter of policy through undue cutting of rates. The trouble is probably at least as apt to be found where employees of the railways number 2,000,000 as where only 7,000 down in western Australia; as likely where 90,000,000 people travel and ship \$3,000,000,000 worth yearly as where 300,000 ship and travel \$10,000,000 worth.

Few know the defects more to their sorrow than the western Australian railways. There, in that tiny system, rises the usual spectacle of a government railway commissioner charged with operation for the people, recognizing and owning publicly to these selfsame evils of state ownership, pointing the danger and fighting in vain to induce his own government to apply a remedy and check its headlong course toward financial ruin of its carriers. When two such policies come together—placation of the labor vote by greater payment of wages, placation of a larger vote by reducing rates, and thus the wherewithal to make the payments—financial stability is likely to suffer from the impact. In western Australia earnings for the fiscal year to June 30, 1913, for the first time in history exceeded £2,000,000 (\$9,740,000). A gain in gross of \$746,000, however, was offset by a rise in expenses of \$791,000 over the year before. Interest paid on debt rose on the average from 3.46 to 3.52 per cent. Surplus fell in two years from \$1,090,000 to \$122,000; the net return on capital from 5.32 to 3.56 per cent. The margin between that 3.52 per cent. interest paid on debt and this 3.56 per cent. net with which to pay it measured on June 30, 1913, the western Australian railway's distance from bankruptcy.

Such a condition occasions little surprise after consideration of what this government system has done to curry favor of its voting passengers. Requests for increased facilities have arisen so frequently and are pressed so strongly, the department has erred so consistently on the side of liberality that the commissioner of railways cries loudly now for a halt. Passenger train mileage and reduced fares must be curtailed severely if ruin is to be avoided. So great has been the surplus of generosity, in fact, that nothing save a deficit is left for passenger traffic. Apportioning mixed train mileage and adding passenger train mileage the earnings from fares represented for the last year \$1.05 per train mile. The cost of working was \$1.29 per train mile. In working cost alone there was thus a loss of 24 cents per train mile exclusive of 43 cents chargeable for interest! Despite an increase of population of nearly 50 per cent. in ten years and increased weight, capacity and standards of equipment the receipt per passenger train mile in 1912-13 was less than in the year 1902-3.

Much of the loss, it is true, arises from a steady decline in length of journeys with consequent loss in the average receipt

*From the Rand McNally Bankers' Monthly, January 26, 1914.

per journey. But it rests also upon the effect of excursion fares now applying to a larger number of journeys on a greater number of days and over greater areas, while in company with repeated rate concessions in deference to demands of the public for increased facilities, passenger train mileage has risen consistently, much of this addition being empty. "When these conditions are realized," says the commissioner, "it may well be seen that the department must rather look for openings to reduce passenger train mileage than to increase it, and for openings to increase fares rather than the reverse."

Unremunerative rates for freight service have arisen largely from a policy of "fostering infant industries" which the present management denounces as now useless to the industries and ruinous to the railway. Agriculture and coal mines have been the chief beneficiaries. Since 1907 fertilizer has been carried at $\frac{1}{2}$ cent per ton mile, a rate pronounced unparalleled in Australia (though by no means in the United States) for the purpose of encouraging the growing of wheat and development of new agricultural areas. The commodity, it was urged, would be carried in cars otherwise run empty to the country to return laden with wheat; the rate was necessary in order to induce more general use of fertilizers, increase the yield per acre and thus add to the railway revenue. This traffic has failed, however, to move as expected and the older farming districts now are pronounced well able to pay in full for the cost of service. Advance to the "miscellaneous" rate is demanded by the management, which would raise the charge to 2.4 cents per ton per mile.

Coal has been enjoying a rate of 30 cents per ton for the first 5 miles plus 1 cent per ton mile thereafter. Denouncement of such a rate as excessively low is interesting when we contrast the rate of .47 cent per ton-mile on bituminous coal which is the average on United States railways. Yet for coal also an advance to the miscellaneous rate is demanded on the ground that this industry too is amply able now to stand upon its own feet.

As part of its policy, to make matters worse, the government has steadily to ask competitive bids for its fuel and is paying excessively for the coal it buys from the very mines so subsidized by unprofitable rates. Had bids been asked, the commissioner of railways asserts, the government roads might have saved 75 cents per ton on the 166,877 tons purchased, a tidy sum of above \$125,000.

"As a matter of policy," says the commissioner, "the various governments which from time to time since inception of the industry have dealt with the question have decided the price and distribution of orders and have abstained from submitting the contracts to competition.

"The difference of at least 3 shillings per ton between the price paid and the commercial value of the coal is in my opinion a bonus to the industry of some £266,700 per annum which should certainly not be made a charge on the government railways."

Solely because of these profitable rates on fertilizer and coal and excessive payments for fuel the government railways last year lost some \$371,000 which must come out of the tax payer's pocket if the system is not to deteriorate. But to make matters still worse wage concessions cut ever larger slices from these depleted earnings. Nor has benefit ensued. "Improvement in conditions of employment," says the commissioner, "has not put an end to the demands made upon the department." In two years wages and salaries on these little railways have risen \$1,110,000. Salaried employees have gained an average of some \$35, wages staff some \$73 annually per man; gains which suggest significantly, to say the least, the comparative numerical strength and organization of the workers affected. Why such expansion has been allowed to consume the meager substance of the railways is best told, by the commissioner himself:

"The year under review has been one of continual pressure from the staff generally for increased remuneration and emoluments and it is with regret I have to refer again to the evil of political influence in this connection.

"If such matters are taken in hand by members of Parliament

or of the government, acquiescence is thereby given to the action of those who have approached them and the railway administration is powerless to do more than protest.

"Unless the practice referred to is put down with a strong hand in whose power it lies to put it down that portion of the government railways act which was and is intended to remove the railways from political influence will become a dead letter. In any case it is a question of time alone when concessions so made to unreasonable demands from departmental employees are bound to result in revulsion of public opinion."

How has efficiency responded to these easy-won concessions?

"It is with regret," says the railway chief, "that I have observed no general increase of energy or effort corresponding with such a large increase of expenditure."

And why should he expect to? Where neither the quality nor quantity of service nor any resultant of supply and demand in the labor market but merely the strength of numbers behind an appeal activates excessive concessions of the kind at the hands of a subservient master, what relation exists between wages and efficiency? Where it is not the justice of labor's plea but solely the force of combined voices which encompasses the desired end, where economic law is discarded and an idea fostered that the government is moved not by reason but by fear at the brandishing of organized labor's weapon of the strike, what relation remains in labor's mind betwixt zeal and compensation?

How uniform is the outcome! C. Colson, councillor of state of France, writing of wage expansion on a state railway on the opposite side of the globe, the nationalized Western Railway of France, says:

"Now if by means of these sacrifices which have to be paid by the tax payers of the whole of France the administration of the state railway has secured the devoted services and the gratitude of its employees, one might perhaps maintain that it had not paid too much for such a manifest advantage to itself and to its customers. But if there is one point about which there is a general agreement among all those who are in direct contact with the employees of the nationalized railway it is that these employees have never been less zealous or more fertile in complaints and recriminations."

Surely the plight of western Australia's state railways, with earnings about to fall beneath interest charges as a result of reductions in rates and increased expenditures for wages and material thus forced upon the government as a matter of policy, is serious. One man, John T. Short, keen minded commissioner of railways, has fought in vain against the inevitable result, his solid advice to his government as to the financial effects of its policy overruled repeatedly by political expediency. But the time for reckoning has arrived.

"I put the question now," says he, "as I claim to have done at all times in the past by reports to the government and by my statutory reports to Parliament. Continuous pressure is exerted in opposite directions. Our customers are constant in urging upon the department increased expense in the shape of train mileage and facilities and on the other hand demands for lower freights and reduced fares are equally constant. Labor organizations press for improved conditions of employment, shorter hours and other concessions. Rates of interest on capital are rising.

"As to where improvement is to be looked for, it is difficult under existing conditions to say. By reduction of the passenger service or by improved conditions for the supply of coal, reduction of expenditures is impossible; and by reasonable increase of freights and fares, as effected in other parts of the commonwealth under similar circumstances, improvement in the earning power is certainly practicable.

"Both alternatives are unpopular; but the results of our working for 1912-13 (crystallized in the fact that it cost £74 to earn £100) appear to me to necessitate their urgent consideration if railway earnings are to continue in the future to cover railway working expenditure and interest charges, and to provide a surplus for the treasury in addition as in the past years."

Maintenance of Way Section

THE next Maintenance of Way Section will appear in the issue of March 13, instead of in the regular third issue of the month, March 20, to enable it to reach our readers in advance of the annual convention of the American Railway Engineering Association. As usual, four daily issues of the *Railway Age Gazette* will also be published at the time of the convention to enable full reports of the proceedings to be given promptly.

The description given in this issue of the extensive service tests of creosoted piling in the Santa Fe trestle across Galveston Bay deserves special emphasis. The fact that a large proportion of the piles driven in 1875 were still in fair condition and that over 90 per cent. of those driven in 1895 were suitable for redriving in other structures after this long service in teredo infested waters where untreated piles are destroyed in two years, is a strong testimonial to the efficiency of creosote treatment. These results are more than usually important because of the time required to make such tests, and the author deserves commendation for the care with which he has searched through the records to secure all the available data regarding the method and extent of treatment and the service to which the piles have been subjected.

Long Life of Creosoted Piling

Water waste is one of those details of railway operation which are frequently considered unimportant and are entirely overlooked. In the article by Mr. Knowles some of the more flagrant of the wasteful methods are mentioned. The conditions he mentions are met on almost every road and are so common that they excite no comment. This is illustrated by the experience of one western road which had erected all steel tanks for several years with one floating gang, which for various causes gradually lost most of its experienced steel erection men. This gang recently erected a steel tank for the storage of creosote at the company's timber treating plant, and after it was placed in service the leakage was so great that the loss of this relatively expensive material made it necessary to empty the tank and tighten it throughout. This experience caused an examination of the steel water tanks previously erected by the same gang and the same general condition was found. The gang was therefore immediately reorganized and the inefficient laborers replaced with more skilled men. As long as the waste was confined to water, no importance was attached to it, although the leakage from the several tanks under inspection showed a loss which amounted to a considerable sum in the course of a year. Much of the waste of water is due to carelessness on the part of employees who fail to realize its cost. Careful instruction, followed by disciplinary measures where necessary, is the remedy. Unfortunately, water is usually provided by the maintenance department and used by the mechanical and operating departments; and therefore departmental lines and jealousies may prevent the full benefits being secured from a campaign to reduce waste. Where such co-operation has been secured, savings reaching \$125 per month have been made at single stations. It requires no exhaustive study to make clear that this field offers an opportunity for economy, and the savings will justify considerable effort.

Reduction of Water Waste

In analyzing derailments in an effort to discover the causes and remedies it is essential that the reports from different divisions of a railway be prepared on a common basis. Otherwise any conclusions reached will be misleading and inaccurate. With the conditions existing on most roads there is a great diversity of practice and terminology in assigning causes for such accidents, and the general tendency of the man reporting is to charge all defects to departments other than his own. This complicates the entire problem and prevents, or at least, hinders, the application of intelligent corrective measures. The situation is similar to that which existed in reporting rail failures a few years ago. Section foremen and roadmasters were reporting failed rails in so many ways that it was impossible to arrive at any definite conclusions regarding the kinds of failure that were occurring and the conditions concerning them from these reports. To remove this condition the Rail Committee of the American Railway Engineering Association formulated a series of definitions of typical rail failures with sketches which have been generally adopted. Not satisfied with requiring the trackman to report on these blanks, many roads also require all failed rails to be sent to some central point where an officer can inspect them and verify the accuracy of the reports. The Boston & Albany has formulated a similar set of definitions for reporting derailments, which are printed in another column. The adoption of this measure should result in the collection of data showing the conditions giving rise to derailments in such a way that a large proportion of them can be eliminated by the application of proper corrective measures. In view of the large number of derailments due to defects of track and roadway, this plan may well be given serious consideration on other roads.

Defining Causes for Derailments

An interesting contrast of ideas was presented in two papers read by P. C. Reilly and Dr. Hermann von Schrenk before the American Wood Preservers' Association last month. Mr. Reilly strongly advocated the use of pure creosote oil, unmixed with coal tar or other materials, for treating timber, and deprecated the fact that the term creosote is no longer considered as describing exclusively a coal tar distillate, but within recent years has been applied as well to mixtures of creosote oil with coal tar and other products. Dr. von Schrenk favored the use of high-grade creosote oil alone wherever it was possible to secure it in sufficient quantities, but wherever this could not be done, he recommended the use of low-grade oils mixed with coal tar rather than a larger quantity of the unadulterated low-grade oils. Both of these positions shed an interesting light on the present situation with respect to creosote oil in this country. While the evidence regarding the effects of the mixing of coal tar and other products with creosote as presented in these two papers was conflicting, it is true that the term creosote is no longer used only for unadulterated creosote oil and is misleading. Because of the scarcity of creosote, many plants have been forced to use lower grade oils, as Dr. von Schrenk stated. The effect of the use of these oils is a subject on which authorities are not entirely agreed. However, if timber is treated with a coal tar mixture, this should be plainly stated instead of calling it creosote. If coal tar is not objectionable there should be no hesitancy on the part of plants using it about stating plainly

The Adulteration of Creosote

that a coal tar mixture is used. The purchaser would then know exactly what he was buying and the condition of many plants using coal tar without the knowledge of their clients would be remedied. With the existing commercial shortage of creosote, lower grade oils must be used, and the complaints being made regarding the misrepresentation of the oils should be obviated.

Over a year ago we described the practice of the Pittsburgh & Lake Erie of laying rail without spacing ties (*Railway Age Gazette*, November 15, 1912, page 936).

Laying Rail Without Spacing Ties

In another column in this issue we give the details of similar practice on the Lehigh Valley, where the rail is laid during the winter. On this latter road 315 miles of rail was laid in this way during the winter of 1912-13, and 87 miles has been laid this winter up to February 1. Because of long established custom, many men believe that the ties should be spaced whenever rail is laid and this necessarily requires that rail be laid in warm weather. As a result they take the position that the laying of rail during the winter is bad practice. The Lehigh Valley is not the only road that lays its rail at this season. Among other roads the Central of New Jersey and the Philadelphia & Reading have laid large quantities of rail on main lines during the winter for several years, although these roads have spaced their ties where such rail was laid immediately after the frost left the ground in the spring. It is evident, of course, that tie spacing can be eliminated and rail laid during the winter months only on track maintained to high standards of line and surface, but where this is done the extent of the damage to the rail is at least an open question. On the Lehigh Valley and the Pittsburgh & Lake Erie, where rail laid in this way has now been carrying very heavy traffic for three years, the injury to the rail feared has thus far failed to develop. On the other hand, the advocates of this method have the important direct advantage of a saving of at least \$125 to \$200 per mile when laying the rail. As worked out on the Lehigh Valley, there is the further important advantage of a more nearly uniform labor force throughout the year, tending towards considerably greater efficiency in all track work. The advantage of employing in productive work even the minimum number of men commonly retained on the winter basis must also be considered. Since the disadvantages feared have so far failed to develop and the advantages gained are already evident, this plan warrants the careful consideration of maintenance officers.

UNIT COSTS FOR TIMBER TREATMENT

THE extent to which unit costs should be made public was the subject of a spirited discussion at the recent convention of the Wood Preservers' Association. Differing largely from other associations in the railway field, this organization is composed of representatives of commercial treating plants selling timber to railways and of men operating treating plants directly for railways. Consequently when commercial practices or unit prices are involved, there is frequently a conflict of interests.

One member gave figures of the cost of treating ties by a certain process at his railroad plant. Another member gave the cost of adzing and boring ties prior to treatment at his plant. In both instances other members, among whom were some railway men, criticized the action of these members in making these figures public, taking the position that this was unfair to the commercial members. These critics maintained that the commercial plants could not equal the costs secured by the railways at company plants, and that with these figures in the hands of the railway purchasing agents, the commercial companies were placed at a disadvantage when attempting to secure business at former prices.

If the men in charge of railroad plants have been able to

reduce their unit costs below those incurred at commercial plants, for equivalent work, it is distinctly to their credit. If commercial plants are unable to meet these figures, including overhead charges, etc., which the average purchasing agent is willing to take into consideration, this is a strong argument for the building of more treating plants by the railways themselves. If, however, the commercial plants can equal the unit costs obtained in railway plants, and there is every reason to believe they can, the only object of attempting to keep prices from the public, and especially from the railway purchasing agents, is to endeavor to secure an undue profit.

The inability to ascertain the actual cost of treating timber, and the disadvantage at which the purchasing agent has thus been placed, has been a strong reason prompting several roads to construct their own treating plants. While it is not to be expected that representatives of commercial concerns will go out of their way to give up or to advertise their unit costs, those operating railway plants have no such motive and are to be commended for their attitude in giving out this information, as they are thereby doing a service to all railways. Nothing is more conducive to improvement in methods of operation, with a resulting reduction in cost, than a free exchange of cost data. The wood preserving industry will receive a greater measure of confidence from the railways when all such data are made public. After all, it is the plant, commercial or railway, which can do the work for the least cost, all things considered, which will eventually get the work to do.

NEW BOOKS

Railroad Surveying. By George W. Pickels and C. C. Wiley. Size 4 in. x 7 in., morocco binding, 263 pages, 66 figures and 14 tables. Published by John Wiley & Sons, New York City. Price \$2.50.

"Railroad Surveying" has been prepared by two members of the civil engineering faculty of the University of Illinois, and is intended primarily for text book purposes. The needs of the practicing engineer have not been overlooked, however, and for actual use in the field the following points are noteworthy. The simplified curve nomenclature recommended by the American Railway Engineering Association has been adopted. The spiral has been co-ordinated with the circular curve, and the spiral given is of a general form which is equally applicable with chords of any desired length as a so-called "six-chord" or "ten-chord" spiral. Turnouts are presented in a practical form as actually used on steam railroads, that is, with straight frogs and switches. The six main chapters cover railroad surveys; maps; distance, curvature and grades; curves; earthwork; and turnouts, connections and crossings. Standard tables are also included in the book.

The Elements of Specification Writing. By Richard S. Kirby, professor of civil engineering, Pennsylvania College. Size 6 in. x 9 in., 125 pages, cloth binding. Published by John Wiley & Sons, New York City. Price \$1.25.

"The Elements of Specification Writing" has been developed by the author from a series of class room lectures. It is written for use as a text with the secondary object of being of assistance to young engineers. It first takes up the essentials of a contract with special reference to contracts on construction work. Two chapters are then given to the advertisement and the proposal. The next seven chapters are devoted to the general clauses of contracts which are discussed from an engineer's viewpoint with numerous citations from actual construction work. Model clauses of various kinds are quoted in each case. The last two chapters cover specific clauses outlining suggested forms for nine construction projects with the hope of assisting the student in framing similar specifications to meet the work he has in hand. The book also includes a classified list of references to current periodicals and the proceedings of engineering societies on various phases of the preparation of specifications and their proper interpretation.

An Unusual Concrete Pipe Plant at Auburn, Wash.

The Northern Pacific Casts Four Sections in Each Form Daily by Steaming the Freshly Poured Forms

The Northern Pacific has constructed a plant at Auburn, Wash., on its main line midway between Tacoma and Seattle at which the reinforced concrete culvert pipe and concrete piles required on the western lines of this system are made. This plant was built primarily to furnish the pipe required on the new

the necessity of hurrying the manufacture of this pipe to meet the demands on the Tacoma-Tenino line, a system of steam pipes was devised for insertion into the forms, and the pipe is now left



General View of Concrete Pipe and Pile Plant

line now being built between Tacoma and Tenino, and began operation on March 17, 1912. While it has not been in operation continuously since that date, as the crew has been engaged in loading sand and gravel for use at other points along the line at various times, 14,624 ft. of 24 in. and 8,760 ft. of 36 in. pipe have been made up to November 1, 1913.

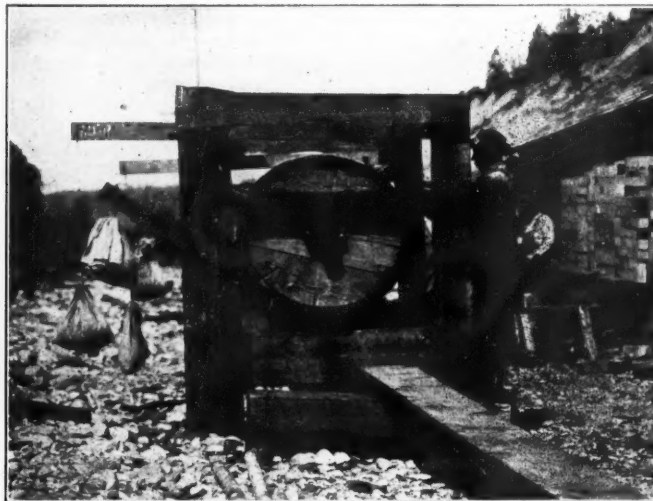
The general type of reinforcing used in this pipe is that patented by the American Concrete Company. Instead, however, of using the elliptical shape, as has been done at the Glendive plant of the Northern Pacific and at other plants throughout the coun-



Pulling Pipe from Inside Form by Lugs in Top of Outside Form

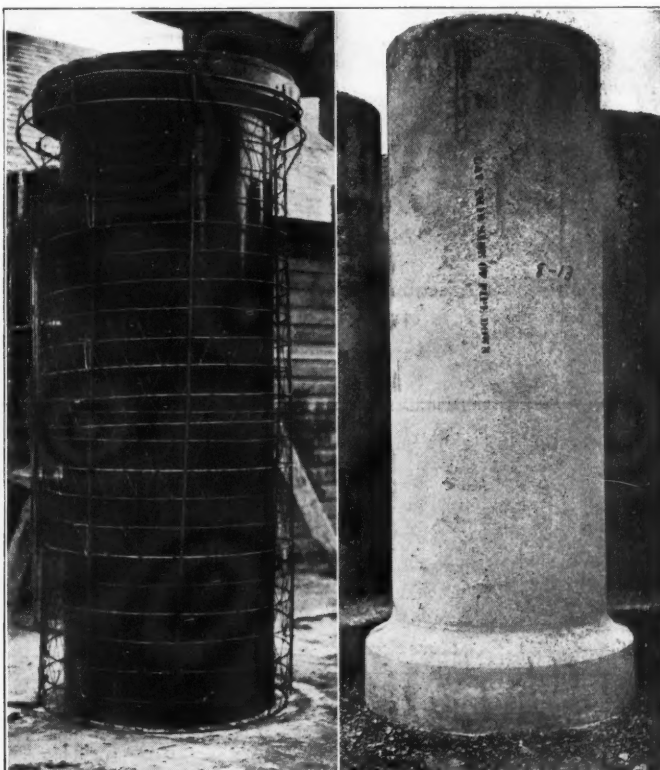
try, a cast iron circular form was used, of the design shown in the accompanying drawing. The reinforcement is bent into shape on mandrels so built that the steel will be near the intrados and extrados at the desired points. Some difficulty was encountered at first in constructing the forms, but they were finally made to the shape desired and were then dressed and lathed to provide a smooth surface for both the inside and outside forms. Four forms each were provided for the 24 in. and 36 in. pipe.

At first the pipes were cast with the bell end up and only one section of the pipe was made in each form daily. Because of



Mandrel for Shaping Triangular Mesh

to take the initial set only before the forms are removed. In this manner it is possible to make four sets of pipe in each 24 in. form daily and three in each 36 in. form. It has also been



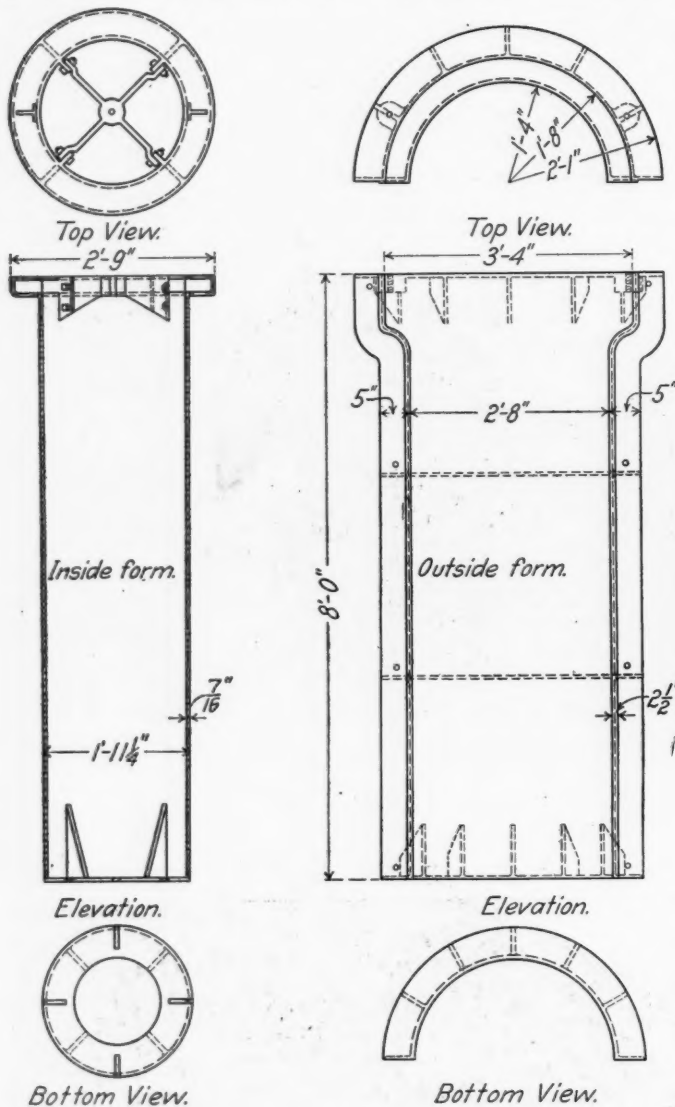
Reinforcing in Place About Inside Form

Completed Pipe Showing Marking

found that better progress is made by inverting the pipe and fastening the inside core to the platform with the four pipes arranged as a battery and all fastened to the same platform.

The method of construction is as follows: The forms are set

in place and the reinforcing is put in and blocked in its proper position with small pieces of steel. The concrete is then poured



Details of 24-in. Concrete Pipe Form

for the entire 8 ft. section of pipe and is spaded with a long spading tool. Steam is turned in and the concrete is permitted

to take its initial set, after which the pipe is lifted clear of the inner form by means of lugs in the outer form and is swung around to the stack pile by a derrick. The bolts holding the outer form together are then loosened sufficiently to release it from the pipe and the outer form is swung loose and put back into position over the inner form. The surfaces of both the inner and outer forms are swabbed with oil prior to the setting of the forms or the pouring of the concrete.

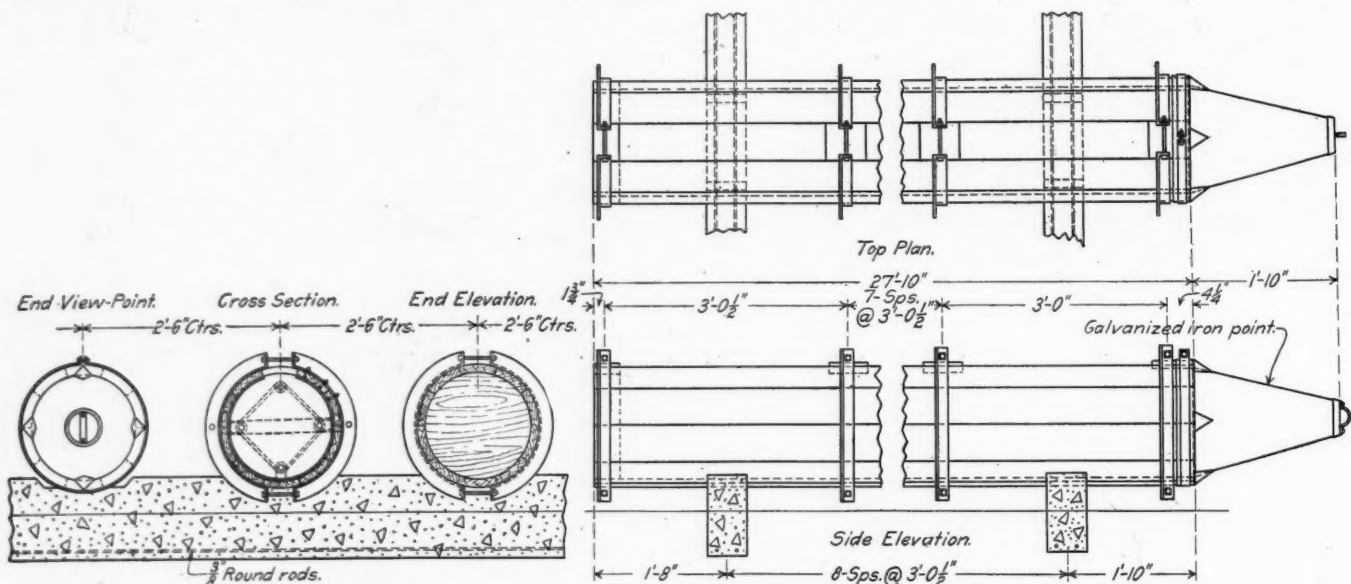
As shown in the drawing, $\frac{3}{8}$ in. round corrugated bars are used for longitudinal reinforcing, $\frac{1}{4}$ in. plain round bars for spacing the brackets and No. 23 triangular mesh for surface reinforcement. The gravel ranges in size from $\frac{1}{2}$ in. to 1 in., and the sand from $\frac{1}{22}$ in. to $\frac{1}{4}$ in., with occasionally some finer sand mixed in. This material is secured from a bank at



Derrick and Stack-Yard

the site of the plant and is washed over screens into storage bunkers from which it is drawn into a $\frac{3}{4}$ -yd. mixer by gravity.

Two classes of concrete are used in making this pipe. A 1:3 mixture of cement and sand is placed in the bottom of the form around the bell, as it has been found that otherwise the coarser mixture used in the main body of the pipe works down into this section. This coarser mixture consists of a $4\frac{1}{2}$:10:14 mixture of cement, sand and gravel. One section of 24 in. pipe requires one sack of cement and 3 cu. ft. of sand for the mortar and $4\frac{1}{2}$ sacks of cement, 10 cu. ft. of sand and 14 cu. ft. of gravel for the main body of the pipe. The 36-in. pipe requires $1\frac{1}{2}$ sacks of cement and $4\frac{1}{2}$ cu. ft. of sand for the mortar and $6\frac{1}{2}$ sacks of cement, $14\frac{1}{2}$ cu. ft. of sand and 20 cu. ft. of gravel for the regular mixture.



Details of Forms for Concrete Piles

Steam is carried to the forms through a 1½ in. main pipe which is reduced to two lines of 1 in. pipe for the two batteries of forms. From each of these 1 in. lines, four ½ in. jets lead to the center of the bottom of each inside form, the tops of the inside forms being covered to confine the steam. Each of the ½ in. openings is provided with a separate valve. About 2½ hours is required in summer and 3 hours in winter for the 24 in. pipe to take its initial set, and 3 hours in summer and 4 hours in winter for the 36 in. pipe. From over 23,000 ft. of pipe made in this manner, only four or five pieces have been found to be faulty.

The equipment at this plant consists of an 80 h. p. locomotive boiler, one 5-ton guy derrick with a 60 ft. mast and a 55 ft. boom, one double drum hoisting engine, one concrete mixer, one 5 in. by 7 in. pump, storage bunkers for sand and gravel and other buildings for the storage of cement, steel, etc. The force employed in making pipe consists of a foreman, one man on the mixer, one man to measure sand and gravel, one man to handle cement, one man on top of the forms to operate the dump bucket, two men with the derrick, one man to spot the bucket under the mixer spout, and one man to operate the hoisting engine.

In addition to making two sizes of reinforced concrete pipe, reinforced concrete piles are made up to 30 ft. in length at this same plant. These piles are cylindrical in shape, 16 in. in diameter with a tapered tip. Wooden forms lined with galvanized iron and fastened with angles along the outside are used. A No. 12 gage steel band 18 in. long with an outside diameter of 16 in. has been experimentally fitted on the tops of some of these piles. A number of piles, some of which were equipped with these bands, were recently driven at a bridge across the Des Chutes river on the new Tacoma-Tenino line. Some of these piles 11 months old with these bands, were given about 900 blows with a 5-ft. drop of a 4,000-lb. hammer, and after driving it was almost impossible to tell that they had been struck with a hammer. An oak follower 6 ft. long was, of course, used. Piles not so banded showed considerable damage to the top, the reinforcement being entirely exposed in some instances for a length of from 18 in. to 2 ft. at the top of the pile.

This plant was designed and is being operated under the general supervision of W. L. Darling, chief engineer, and under the immediate direction of J. C. Breedlove, assistant engineer. We are indebted to Mr. Breedlove for the above information.

A CORRECTION

In our report of the convention of the American Wood Preservers' Association in the issue of January 23, page 189, Dr. H. von Schrenk was incorrectly reported as advocating the use of poor creosote for treating timber. Dr. von Schrenk advocates the use of high grade creosote for treating timber whenever it can be secured, as it is cheaper in the end, but where it is impossible to secure sufficient quantities of this high grade creosote, he advocates the addition of coal tar to the lower grade oils instead of using larger quantities of these poor grade oils.

ABSTRACT OF ENGINEERING ARTICLES SINCE JANUARY 23, 1914

The following articles of special interest to engineers and maintenance of way men, and to which readers of this section may wish to refer, have appeared in the *Railway Age Gazette* since January 23, 1914:

New Great Northern Station at Minneapolis, Minn.—An illustrated description of the new Minneapolis station built by the Great Northern and used by it and four other roads, which includes a number of unique features and is unusually complete in its equipment, was published in the issue of January 30, page 227.

Reports of Two Derailments.—An abstract of the reports made by the chief inspector of safety appliances of the Interstate Commerce Commission on two recent derailments due to track conditions was published in the issue of January 30, page 226. An editorial commenting on these reports was published in the same issue, page 212.

Internal Transverse Cracks and Fissures in Rails.—Robert Job is the author of an article on this subject, published in the issue of February 6, page 266, in which he calls attention to the fact that this much discussed cause of failure is not a recent development caused by extreme modern conditions in traffic or variations in composition of the metal, but has long been known and studied. He concludes from the studies commented on in the article that failures due to transverse fissures are largely the result of poor mill practice rather than track or traffic conditions.

Re-Appraisal of Railway Property in Nebraska.—E. C. Hurd, engineer in charge of the railway valuation of the Nebraska railways, described the methods used and the results secured in that recently completed work in an article published in the issue of February 6, page 275.

Electrification of Heavy Mountain Grades.—In a recent study undertaken to determine the possibility of economically electrifying that portion of the Santa Fe between Trinidad, Col., and Raton, N. Mex., crossing the Raton mountain, the proposed electrification was found to be unprofitable. This study and the conclusions reached are described in an article by Joseph P. Ripley of the J. G. White Management Corporation, in the issue of February 13, page 313.

New York Central Station at Rochester, N. Y.—The new station at Rochester, N. Y., an important passenger point on the main line of the New York Central, was described and illustrated in the issue of February 13, page 317.

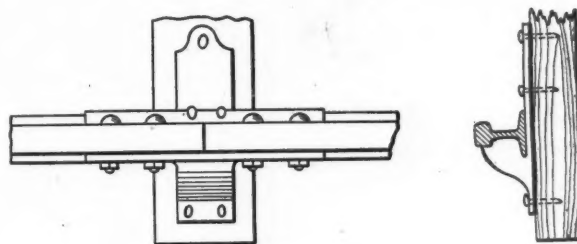
The Work Involved in the Valuation of Railroads.—An abstract of the speech made by Charles A. Prouty before the recent annual meeting of the Chamber of Commerce of the United States, in which he discusses some of the problems in arriving at a valuation of railway property and some of the benefits he thinks will be derived. This was published in the issue of February 13, page 320.

The Coleman Cut-Off.—An important link in the Santa Fe line from Galveston to the Pacific coast is nearing completion between Lubbock, Tex., and Texico, N. Mex. The general features of interest in the construction of this line were described and illustrated in the issue of February 13, page 325.

Instructions to Field Parties on Federal Valuation.—A brief resume of the tentative draft of instructions to field parties engaged in the valuation of railway property under the direction of the federal valuation board and of the final specifications for maps and profiles to be submitted by the carriers in connection with this valuation, was published in the issue of February 13, page 329.

THE MUSGROVE RAIL JOINT

A new type of rail joint and brace has recently been designed by Robert G. Musgrove, 25 Broad street, New York City, and is now being tested on the main lines of four roads, including the Central Railroad of New Jersey, near Jersey City, and the Staten Island Transit Railway, a subsidiary of the B. & O., at St. George, Staten Island. This joint can be made for any size rail desired and for either four or six bolts. It is designed to act as a tie plate, rail brace and angle bar combined and by its solidity, to eliminate the battering of rails. The tie plate is



The Musgrove Rail Joint

made from 14 in. to 17 in. long and ½ in. thick. Those now in service are made of manganese steel to secure high strength, but they can be made equally well of other steel, if desired. It is claimed for this joint that it will prevent rails spreading or turning over and also that, should the bolts become loose, as they are apt to do with any joint, this device will not give way.

CEYLON'S NEW CABLE SERVICE.—Arrangements have recently been perfected whereby cable messages can be transmitted from London to Colombo, the capital of Ceylon, within an hour. It is reported that in some cases messages for Ceylon despatched in London have been received in Colombo within thirty minutes.

ERECTING A LONG STEEL GIRDER SPAN

One of the longest steel girder railway bridge spans ever put in service in the northwest was erected on November 16 for the Duluth, South Shore & Atlantic, near Shilo, Wis., by the American Bridge Company. This span, 121 ft. long, center to center of end bearings, 122.5 ft. over all, weighing 108 tons, and designed for Cooper's E-50 loading, was a portion of a shipment of 93 cars of fabricated bridge material which is being used to replace as rapidly as possible the wooden trestles and trusses on the company's lines. This forms a part of the general program of increasing efficiency inaugurated in 1912 by W. W. Walker, general manager. The bridges are being designed by the engineering department, E. R. Lewis, assistant to general

difficulty, owing to the necessity for cutting the members of the Howe truss and its wooden bridge seats in order to place the steel bents and braces. This work was accomplished without mishap by the erecting department of the American Bridge Company, after the wooden structure had been sufficiently reinforced. The entire river span was assembled and bolted together on two standard steel flat cars and moved out to position on the old bridge by a derrick car at 7:30 a. m. With the derrick car on one end, and a gallows frame and falls handled by a hoisting engine on the other end, the span was hoisted clear of the cars and the latter were then pulled out on to the wooden trestle at the gallows bent end. The deck of the old wooden span was then removed and dropped piece by piece into the river, where it was caught by a boom and thence piled on the banks.



Placing Girders in Bad River Viaduct at Shilo, Wis.

manager in charge of engineering and J. E. Bebb, office engineer.

The bridge west of Shilo is a single track structure spanning Bad river on the main line between Sault Ste. Marie, Mich., and Duluth, Minn. The new structure replaces a 150 ft. deck Howe truss with trestle approaches having a total length of 1,349 ft., all but 955 ft. of which was filled in 1912 and 1913. The new steel structure is a deck girder viaduct on reinforced concrete footings, built on pile foundations. The long river span is about 90 ft. above the bed of the river, and 73 ft. above high water. The approaches consist of 30-ft. tower spans and 64-ft. intermediate girder spans. The total weight of steel in the structure is 773 tons.

The erection of the river span under traffic was of marked

The 108-ton girder span was then lowered into position inside the Howe trusses and final connections made at 2:30 p. m.

The long girder was used for the river span of this bridge in preference to a truss span on account of the wide difference in cost of erection of the two types of bridge under the conditions governing this particular case. Pile foundations and heavy reinforcement of concrete footings were made necessary on account of the treacherous red clay bottom.

NEW STREET RAILWAY IN PALESTINE.—The Turkish government has recently granted a concession to a French bank for the construction of a street car line from Jerusalem to Bethlehem, and for the lighting of Jerusalem by electricity.

The Economical Operation of Work Trains

The Second Series of Papers Received in the Contest,
Discussing Methods of Increasing Their Efficiency

THE ECONOMY OF WORK TRAINS

By G. W. REAR

General Inspector of Bridges, Southern Pacific, San Francisco, Cal.

Work trains on operated lines are expensive, but just how much so is not generally known. The cost of the train service is not fixed, but it runs from \$40 per day up, mostly up. The number of hours of actual work performed is small, many days only one or two hours being put in and that in several periods of a few minutes each. It would be safe to say that the average work train will not work over three hours per day in useful work. There are three principal reasons for this short working time: density of traffic, poor despatching and poor handling of the train by the crew.

Where traffic is heavy, there is little time available between trains for work train service and as revenue traffic is most important, little can be done to avoid this kind of delay. Train despatchers are sometimes known as "train detainers" and where work trains are concerned, the name is often appropriate. In selecting meeting points, the work train is usually given the worst of it and a great deal of time is wasted on passing tracks, waiting for trains. Where orders are given, the work train is usually last to get recognition. This is excusable on heavy traffic lines, but it often occurs on branch lines where there are only two or three trains per day. There is no organized conspiracy against work trains, but the poor despatching is the result of a lack of understanding as to the cost of the work train to the railroad.

Very few train crews make good work train crews, some from a lack of the natural instincts for constructive work and others from a willful attempt to stretch out the job. They are all experts in figuring overtime and it is a wise supervisor that can beat the overtime game. A few trainmen enjoy work train service and it is wonderful what they can accomplish in comparison with the average crew. The good work train conductor takes time by the forelock, gets a thorough understanding of the work to be done and insists on getting proper working orders. If the operator is off duty during any of the working hours, he arranges to get orders to cover that time. He keeps the brakemen out of the caboose and awake, so that when a move is to be made, it is not necessary to hunt up a trainman.

The good work train engineer takes an interest in the work. He does not stand on the siding two hours waiting for trains to pass and then find, when all is ready, that he is out of water. When at work, he keeps a lookout for signals and does not have to be awakened after each stop of five minutes.

In manning the train, a great deal depends on the nature of the work. As the working time is usually in several short periods, it is necessary to do as much as possible in the shortest time. This calls for a large crew so the work can be speeded up. Proper equipment is more economical than manual labor, if there is sufficient work to warrant its purchase.

The economy of doing work by regular trains instead of by work train, depends on the amount and nature of the work to be done and also on the time of day that the regular freights would arrive. It also depends on the trainmen's schedule of overtime, etc. It would be poor economy to hold a gang of men several hours to do a small amount of work and then have the trains come along about midnight. As a rule, if the work can be done in an hour or less, regular trains should be employed, if they can do the work during working hours and any certainty can be given as to what day the work will be done. The total cost of a work train and crew will be from \$100 to \$150 per day and in the neighborhood of one dollar a minute of actual working time.

In considering what can be done to increase the efficiency of

work trains, it appears that something can be done by several officers and employees. The management should approve the purchase of sufficient labor saving devices, such as ballast unloaders, and spreaders, rail loaders, ditchers, locomotive cranes, self-propelling pile drivers, etc., so that a large amount of work train service can be avoided altogether, and where unavoidable as much work as possible can be accomplished in the available time.

The superintendent can arrange to give the work train more time by running the extra trains at such times as to delay the work trains least. This can be accomplished by bunching the trains instead of running them at regular intervals all day. He may also overlook small delays to other trains, when caused by an attempt to expedite the work. In driving piles, for instance, many more piles can be driven if the chance of delaying a freight train a few minutes can be taken.

The despatcher can do a great deal to promote the efficiency of the work train by giving it a little the best of the "meets," and by prompt recognition when orders are asked for. Orders are often given that some extra will wait at A until 8.10 and at B until 9.10, etc., for the work train when it does not stand any chance of getting to A before 10 o'clock. Regulars are said to be on time when they are from 30 min. to 2 hrs. late. If the despatcher will understand that the work train is costing about a dollar a minute of actual working time, he will see that delays are expensive.

The conductor can do most to lengthen the working periods by asking for orders promptly, stating just the kind of order desired, doing the switching quickly and taking advantage of every minute to be on the main line. He should keep the trainmen on the alert to give signals when movement is required. The engineer can do his part by oiling up and taking water when it will delay work as little as possible, being on the lookout for signals and answering them promptly.

In distributing ballast, unloading and loading rail, etc., work train service is necessary and a supervisor can best promote efficiency by organizing the work in such a way as to have as little train movement as possible and by having proper appliances and sufficient men to do the maximum amount of work in the time available. Each morning he should furnish the work train conductor with a complete program of the work for the day, with an estimate of the time required for each part, so the conductor can get his working orders accordingly. He should carefully consider the economy of doing his work by work train or regular train, taking into consideration the costs and delays and, if a work train is advisable, he should arrange the work so as to get a full days work out of the train.

No doubt, the most economical way to use a work train would be not to have one at all and considerable money can be spent to avoid the use of one. Where the job is large enough, a spur should be put in on which regular trains can set cars, the cars being handled to the work by locomotive cranes, car derricks or pile drivers. It takes very little money to put in a spur where no grading is required and one or two days expense of a work train will do it. This is the best arrangement for all bridge work where a work train would be required for two or more days and where self-propelling tools are available.

PRACTICAL CONSIDERATIONS IN WORK TRAIN OPERATION

By J. C.

In discussing methods for the actual handling of a work train, the first suggestion would be a negative. Don't use a work train except when absolutely necessary. Remember that the equipment and crew cost about \$40 per day and that the average daily

cost of a gang is about \$50, making a total of \$90 per day. This cost does not include interference with the regular traffic on the road. It is true this last mentioned cost does not enter maintenance of way expenses directly, but one can be assured that it creeps in indirectly most seriously when, at some future time, the despatcher recalls a complete upset in his plans, occasioned by a work train, and erring upon the side of safety, places the work train on a siding for a few hours. Therefore, estimate the cost of performance of work by trains or otherwise, and be governed by the result.

This brings up the first important feature in the handling of the train; planning the day's work. It is assumed that the proper request has been made for the work train, stating the kind of work to be performed, the class of power and equipment required, the points to be reached and the time work should be started and completed. Reduce the work train movements as much as possible. Time and money are quickly lost running a train over the road unnecessarily. Reduce the limits of the working zone to a minimum. If the work is concentrated, arrange for at least one end of the working zone to rest upon a siding or passing track and if practicable, include a telegraph office and water station.

Determine the number of men necessary for the performance of work, inclining slightly toward a surplus rather than otherwise. Arrange to have the men on hand. Should it prove necessary to run the train over a long section of track, endeavor to make such plans as will entail a minimum amount of time at meeting points and plan work to be performed while making these meeting points.

After these matters have been decided upon, give the despatcher a message, stating concisely the date, time and place the train should report for service; the destination of the work train; the intermediate stops and the probable length of each stop and the limiting points of the working zone. With this information the despatcher is enabled to handle the train intelligently without unnecessary waste of time.

Concerning the execution of the work, place a thoroughly capable man in charge of the train. Give the work train conductor a complete statement of the day's plans, including information given the despatcher. This enables everyone to work in harmony and allows the conductor to place his flagmen properly. Arrange for meeting trains and ask for orders intelligently. Insist upon having a competent and willing train crew, prompt despatching of train and efficient power and equipment. Should it become necessary to change the plan of the day's work, notify the despatcher and conductor promptly, giving the details of the rearrangement. These precautions will prevent unnecessary loss of time.

It is a simple matter to tell a foreman to keep his men diligently employed, but it is out of the question to give minute and detailed instruction for the accomplishment. General suggestions, however, may be employed, applicable to all work. Don't permit men to overcrowd at one particular point. Don't allow three men to go after a two man job, and don't put two men at a three man job. Don't permit loafing on the train or "excursion riding" to water stations and passing tracks. Arrange for performance of some kind of useful work when the train is away. Don't play favorites among the men; determine their capabilities and place them intelligently. Study the work in hand and distribute forces advantageously, endeavoring to develop a method of reducing cost. If practicable, the gang should be placed or quartered in camps or camp cars. This increases its efficiency and promotes its mobility. Such camping points must be conveniently located, preferably at telegraph offices and water stations.

If ditching, either by machinery or by hand, see that the proper number of men are on the cars as "trimmers"; that the track behind the train is properly cleaned up and that the ditch and roadbed lines are properly observed. Deposit material from ditches where it will prove useful in strengthening the roadbed.

When distributing ballast the class of equipment in service

affects the performance to a great extent. With Rodger ballast cars, two men may frequently handle an entire train; if hopper cars are used, more men are required; if gondolas are used, and the contents require shoveling, a large force is necessary. Care must be exercised to keep the distribution regular, thereby avoiding the necessity for "peddling" stone when the work is "dressed up." Frogs, switches and crossings must be thoroughly cleaned after ballast is deposited, to prevent train accidents.

Handling rail and heavy track material is greatly facilitated by the use of a rail unloader. This, of course, affects the size of the gang. In any event, one or two men should follow the train gathering all small material or scrap. Use flat cars or low side gondolas for this work, as well as for handling ties. When ties are being unloaded, have a man follow the train, removing all ties that foul the tracks or portions of roadbed used by employees.

Summing up, it may be safely said that the greatest source of waste in work train service is in the movement of the train; the second greatest is in the efficiency of the gang and the third is in the size of the force employed. A work train unemployed for an hour means a loss of \$9; a gang wasting 10 per cent. of its time means a loss of \$9 (including work train cost) and one surplus or useless man for a day means a loss of \$1.65. These costs, small in themselves, increase at a wonderful rate if extended over a long period. In conclusion, don't use a work train unless it is really required.

INTELLIGENT SUPERVISION OF WORK TRAINS

By C. C. SPRIGG

Formerly Supervisor, Lehigh Valley, Easton, Pa.

In order properly to maintain track, there are certain classes of work which cannot be handled by the track forces with their ordinary appliances. To handle such work the services of a locomotive and cars are necessary. This train earns no direct revenue for the company and to those operating officials without maintenance or engineering training it is a train which spends money only. For this reason work trains are continually side-tracked, held in and out of yards, purposely delayed when moving by slower trains when they could be run around, are given inferior or worn-out engines, and are used for any and all emergencies that may arise. They are looked upon by all concerned as a nuisance and are treated as such.

To overcome these obstacles, the following suggestions are offered: First, endeavor to interest the conductor assigned to the work train (one has practically no choice in the matter) in maintenance of way work. Tell him all about the work, and how and why it is being done. Show him in dollars and cents what delays mean. Let him understand that you look to him for the efficient handling of his train and that you will hold him for it. Then spend a few days with him and show him how to go after yardmasters, towermen, despatchers and other conductors for a fair chance to do his work, at the same time having him bear in mind he must not jeopardize revenue or passenger business of the company. He must be made to feel that his work is just as important as any other class of train service and that the supervisor is behind him, backing him up in cases of trouble and seeing that he receives no unjust censure at the hands of the transportation department. Second, place a man on the train as work train foreman who is an all around maintenance man, familiar with all local conditions, train movements and classes of trains on the entire division. Such a man will be in a position to properly handle the conductor and see that no unnecessary moves or delays are incurred. He must be a man whom all foremen, conductors and others have respect for and must have authority over all foremen and conductors on work trains. To such a work train foreman, the work of the day or week can be outlined and he must be left to handle it in his own way, using his best judgment and doing his own figuring. Many conditions arise which may change the plan of the work several times in one day. Only by being perfectly familiar with the work of the

division, will he be able to keep the train and men busy and at the same time do efficient work. It is the duty of the supervisor to see that the work train foreman is informed regarding the location of all materials, the requirements of the different track forces, and the nature, class and amount of all work to be done. In the absence or lack of such a man to handle the work train, the supervisor himself should assume the duties and spend all his time possible with the work train.

In these days of steam appliances, the size of the gang regularly assigned to the work train is important, and to secure the best work with the least amount of delay and danger to men, a regularly assigned gang is just as important to the work train as a regular work train foreman. To insure such a gang and at the same time reduce the cost of idle labor while the train is in motion or is delayed by outside causes, it will be found that the number of men comprising the gang must not be less than 6 men nor more than 15. The most efficient gang will be found to consist of 10 men, one of whom should be paid slightly more and be known as the assistant foreman. He should be of the same nationality as the rest of the gang and can be of very great assistance to the work train foreman in checking up materials, interpreting orders and handling the gang while the foreman is attending to other work train matters. On special occasions when more men are needed, as for unloading ties, the section forces or extra gangs can be drawn upon.

A rule that should be followed in all work train operations is to never do anything by hand that can be done by steam. This not only applies to the uses that the engine of the train can be put to, but includes making full use of whatever form of steam appliance the supervisor has, whether it be a locomotive crane, a steam or air rail handler, a ditching machine or a derrick. Their uses can all be stretched and, with a little ingenuity, any one of the above can be made to do much of the work of the others. The work train outfit should not be considered complete without some form of steam apparatus.

A work train should never be ordered unless there is at least one week's work ahead. When furnished, it should be properly equipped with tools, and if retained permanently, should be fully equipped for all emergencies.

As the supervisor will have to depend largely upon the reports of the conductor and work train foreman for his knowledge of what is being done, he should insist on full and complete reports from each. He should go over these personally, any unnecessary detentions or moves should be investigated and the trainmaster and dispatcher should be consulted freely. Experience has shown that the lack of co-operation between the dispatcher and supervisor is the most serious cause of delays and consequently of lack of results on the part of the train. It has been found that, if the day's work is made known to the dispatcher in advance, much better results will be accomplished.

CO-OPERATION IN HANDLING WORK TRAIN SERVICE

By S. C. TANNER

Master Carpenter, Baltimore & Ohio, Baltimore, Md.

To get the best results from work trains, the following organization should be established and maintained, as the responsibility rests on all concerned. They must all co-operate to the fullest extent, as any one connected with the movement of a work train may through his neglect to co-operate cause a total loss of the efforts of all the rest.

Except in cases of emergency a train should never be ordered unless a full day's work is previously arranged. The train dispatcher should then see that the work train is at the location called for on time. It must be at the designated place when the work is to be commenced, for, as a general rule, many men and often valuable equipment are idle waiting for it to arrive. The earnest support of the train dispatcher is essential throughout the work to insure efficient service.

Train and engine crews should be regularly employed in work train service, as they must be fully familiarized with all the

movements required by work train foremen, and know how to take advantage of every minute of the time. Much time is always lost on side tracks, and with new work train crews each day more time is lost than necessary. There should be a good live work train foreman, and where a large force is employed, he should have two good leading laborers to help him push the work and at the same time familiarize themselves with the work train requirements, so that they may become capable of taking the important position of work train foreman. The crew and foreman should work together and be close in touch with every movement of the work or train at all times. When it is necessary for the train to take a side track to wait for a passing train, the foreman should employ his men on other work, keeping a strict account of this, separate from the work train charges.

Another important necessity is a good locomotive, not necessarily a large one, but one that is in good physical condition. It should be equipped with an extra large tank for coal and water, for much time is often lost waiting for locomotives to go for water. Good work engines should have two good air pumps for use in operating rail unloaders, etc. They should also be equipped with a good water pump or syphon, as there are many times that such equipment can be used to take water from side ditches or small streams which pass under the tracks.

As the track supervisors often have work trains in their work, they should, at the same time, handle the loading and unloading of bridge and building material. This kind of work can be handled much cheaper in this way than with regular bridge and building forces, as it alone seldom justifies the ordering of a work train.

DITCHING CUTS WITH A WORK TRAIN

By R. U. BRAWNER

Supervisor, Central of Georgia, Columbus, Ga.

A competent foreman should be in charge of a gang of not less than 40 men where regular ditching is being done. One should have ten flat cars in the train. Where the dirt is uniform he should place four men on each car and not allow them to leave their cars unless ordered to do so by the foreman. The dirt should be unloaded in the same way as it was loaded, unless there is a short space one wishes to put a lot of dirt in, when he should double up the men to fill up this space.

One should figure on trains running on the road and when there is only a short time between trains he should work near the siding to save the time running the train and work close to the siding should be held for such occasions. When ditching wet cuts and cuts where the dirt is thin, the dirt should be piled up before attempting to handle with the train, as the men will handle three times as much material. The men should be employed on this kind of work when the train has gone to a siding to let other trains by.

HANDLING WORK TRAIN CREWS

By F. W. FULLER

Roadmaster, Northern Pacific, Dilworth, Minn.

The cost of handling work equipment in comparison with the value of the work done is the prime consideration in the proper handling of work trains. With the present working schedules of engine and trainmen, the necessity of getting full value for the money spent is very important. A train and engine crew for work train service costs approximately \$30 for a 16 hour day, and I find it economy usually to work crews this length of time to get the full 10 hours' work out of any laborers that may be working with them. While hauling ballast I find a great saving can be made by getting things lined up so that each crew will make mileage instead of hours. This puts ginger into the whole work, as the crews vie with each other in making time from the pit to the place of unloading and returning. This speeds up the shovel men and the spotting and unloading crews, as they do not want trains to accumulate on them. The crews

assigned to this hauling job are each furnished with an extra caboose for engine men and an engine watchman always goes with each crew, so that they can tie up at any point. This gives them an opportunity to go as far as the time limit will allow.

In all work train services it is important that one has the good will of the train and engine crew. As work trains are usually away from home and are out for the money, I figure to work them the full 16 hours, and have found that, in allowing them to do this, I can also get greater value out of them. In picking up rail, ditcher work, etc., I have always found that making the conductor feel he is in charge of job and allowing him to keep the time of laborers, etc., for which he gets about \$.80 per day extra, tends to increase the efficiency of the whole crew.

On small jobs, the official asking for work trains should figure very carefully to see that the cost does not greatly exceed the saving of convenience. One can usually get small jobs done by regular freight crews, if they are not crowded, at a very small cost, but there is no means of saying just where to employ a work train and where to employ regular freights.

THE ECONOMY OF WORK TRAINS

By A. M. CLOUGH

Supervisor, New York Central & Hudson River, Batavia, N. Y.

It will always be a disputed question between certain operating officials and the men of the maintenance of way department whether a permanent work train on a roadmaster's division is a necessity, and it is indeed deplorable to enumerate the laborious work that track forces are required to do many times on divisions where work trains are not allowed, in loading, unloading and handling material either left at depots or sidings along the road or unloaded, many times carelessly, from way-freights which have a time limit order from the despatcher to make a certain point, and whose crews have very small regard or patience with the unfortunate track gang which is obliged to unload material from their trains. Not much better results can be obtained from an occasional work train where a crew is ordered that has no knowledge of work train methods or usages and where a gang is picked up for a few days with no work train experience. The crew of an occasional work train is much less to be relied upon by a despatcher, as the men cannot figure how long it will take them to do certain work. By failing to make a meet or a siding when they are expected to, the despatcher is unable to trust them unless he has a wide margin of time and in consequence keeps the occasional work train on the siding much more than he would a regular work train.

However, if an occasional work train is to be used, due notice should be given the division superintendent or trainmaster and they should be requested to furnish at least a conductor who has some experience at this work. A suitable car or caboose should be supplied to carry the men, and a gang of men, in charge of a good, careful foreman, should be on hand promptly at the appointed place. If an assistant roadmaster is not to accompany the train, the foreman should have the orders for at least one day's work in advance, and he should show those to the conductor or give him a copy, so that he would be able to figure out and advise the despatcher of his routine and in turn advise the foreman how he sees certain moves will expedite the work. No work train conductor should be expected to handle both his train and the men at any time.

A permanent work train should have a gang of permanent men, with a capable foreman in charge, and a good car to transport them. It should also have a derrick or small steam crane to handle the numerous heavy articles now used in track maintenance, such as rails, frogs, crossing frogs, switch timber, bridge timber, etc. It could also be used to do ditching and light wrecking and there should always be an emergency car loaded with rails, ties, frogs, switches, bolts, spikes, etc., at division headquarters where a work train is located, so that it will be quickly available in case of accident. For handling all kinds

of division work where a steam derrick is used a foreman and ten men make an economical work train gang. When ditching or handling gravel or cinder ballast which is loaded by hand and where the engine and crew must handle the train, a larger force, of course, accomplishes more for the amount charged for the train and crew.

The advantage of doing this work with a regular work train and a well organized gang over handling the same by way-freight or extra work train is shown in the following tables from actual tests made when the question of permanent work trains was a burning one:

By Regular Work Train: 175 cu. yds. of earth fill for station grounds from borrow pit two miles away, 30c. per cu. yd....	\$52.50
By Wagons and Teams: 175 cu. yds. of earth fill for station grounds from borrow pit 1,200 ft. away, 45c. per cu. yd....	78.75
By Regular Work Train—One Day: 1,761 treated ties distributed on six main line sections, 125 tie plates loaded and unloaded, 108 100-lb. rails unloaded on one main line section, 108 pairs angle bars for same, total cost.....	54.06
By Local Freight to Station and Run Out by Section Gangs on Six Main Line Sections: 1,761 treated ties distributed by six different section gangs from station and way siding, \$96.90; 125 tie plates distributed, \$3.40; 108 100-lb. rails trucked out one-fourth mile and 108 pairs angle bars, \$34; total cost....	134.30
By Extra Work Train—One Day: 1,500 treated ties distributed on six main line sections.....	61.76
By Regular Work Train—One Day: 3,366 untreated ties delivered on eight main line sections.....	51.86
By Local Freight and Section Gang—One Day: 3,306 untreated ties distributed by section gangs from stations and way sidings on eight main line sections.....	187.15
By Regular Work Train—One Day: 80 kegs bolts and spikes distributed, 247 100-lb. rails, 247 pairs 100-lb. angle bars distributed on two main line sections, total cost.....	54.06
By Extra Work Train—One Day with Section Men: 308 100-lb. rails, 220 pair 100-lb. angle bars, 52 kegs bolts, total cost....	102.00
By Regular Work Train: 2 sets No. 10 switch timber loaded, hauled fifteen miles and unloaded, train going to do other work.....	3.40
By Local Freight and Section Gang: 2 sets No. 10 switch timber loaded at freight house and unloaded and trucked to point needed after being handled by way freight.....	5.86

In none of those cases are freight charges included where material was handled as freight, while where work train handled it rental is charged for the equipment used in each day's work.

It would, of course, be inconsistent to have a regular work train on a division if there was not enough work to keep it busy at all times, but the benefit of the use of a steady train is so apparent that it would pay to keep one regular train to do the work on two divisions, and at any rate there are very few roadmasters' sub-divisions where a very great amount of work that could and should be done by a train is left undone, such as ditching, widening cuts and riprapping, to say nothing of the work outside of the maintenance of way department, such as unloading coal for stations and pump houses, distributing material for telegraph and signal departments now done by local freights, etc.

FUNDAMENTAL CONSIDERATIONS IN THE USE OF A WORK TRAIN

By F. M. PATTERSON

District Engineer, Chicago, Burlington & Quincy, St. Louis, Mo.

The comparative costs of doing any particular job with or without a work train must receive careful study before a decision is reached. Of course, certain operations, such as extensive distribution of rail, ties and ballast and the picking up of old rail, require no argument in favor of the train, but it is surprising what a little forethought and organization will do in obviating the use of such an agency in other cases where the quantities to be handled are small and recourse may be had to the occasional use of the way freight. For instance, ballast may be unloaded in this way in lots of from 5 to 10 cars with little expense or loss of time if furnished in Rodger cars or cars of a similar type. Ties may sometimes be unloaded by the way freight if only one or two cars are to be handled at a time, but it is usually more economical to have the allotment for any branch or sub-division delivered as nearly as possible at the same time and to employ a work train with sufficient force to unload them rapidly. In ditching it is often a question as to whether it is better and cheaper to dispose of the dirt by trucking on push cars or by train, and here the amounts to be handled, the length of haul and the disposal of the material are the determining factors.

Having decided on the use of the work train, the organization of the force and the selection of the equipment should receive attention. Too often the one responsible for the work has little voice in the choice of equipment or of the train and enginemen who are to handle it and in many cases the fault lies as much with him as with his superior officers. He is the one who knows the conditions to be met and by a proper presentation of the facts should be able to win his point. The equipment should be that best suited to the work in hand and no effort should be spared to secure such as will save time and labor on the road. All equipment should be thoroughly inspected and put in good order before it is sent out.

The selection of the train crew is of the utmost importance. The men should be of the alert and active type who realize the importance of getting over the road and are quick to take advantage of situations as they arise, for the loss of a few minutes here and there may mean hours of delay later with opposing train schedules, especially on single track lines. To avoid such delays the foreman and work train conductor should have a full understanding of the work to be done and should shape their programs accordingly. It is needless to say that the gang accompanying the train should be as large as the nature of the work will permit, for a work train represents a large item of overhead expense and to be economical must add as little as possible to each unit of work performed.

Co-operation with the despatcher must be had if successful results are desired, and this often means concessions on both sides. These concessions should be made not with the thought as to the gain or loss of prestige for either department, but solely to further the interests of the railway to which both owe allegiance.

It is universally recognized that the roadmaster or supervisor should spend a portion of his time with work trains, but the importance of assigning an assistant to give his attention to these trains where their work is varied, they are necessary to keep several jobs going, is not so generally appreciated. Where the use of several trains is required in the same territory the appointment of an assistant trainmaster, usually some conductor who has shown special aptitude in work train service, is sometimes advisable as a policy productive of economy and efficiency. The value of having someone in authority always on the ground can hardly be overestimated.

The practice of having the conductor act also as foreman is one that has proved successful in some instances, but is one that cannot be recommended off-hand, and where successful it will usually be found where permanent work trains are maintained, a policy that in itself is open to question and that requires constant vigilance lest it become wasteful.

MEANS OF AVOIDING WORK TRAIN SERVICE

By E. R. MEREDITH

Assistant Supervisor, Philadelphia & Reading, Coatesville, Pa.

The most expensive tool furnished to the supervisor is his work train. Moreover, its relative expense is increasing each year out of proportion to the services which it renders. The charges are steadily on the increase, which, together with the rising cost of labor, make the work train more and more of a luxury. The word luxury is used advisedly, for it is the purpose of this discussion to indicate in a brief outline that its services can be entirely dispensed with for a great amount of work for which it is usually regarded as a necessity.

A work train's duties are broadly divisible into three main classes: distributing material, policing and emergency work. A great deal of the first, almost all of the second and even some of the third class can be done by other means at far less expense.

Let us consider first the distribution of material. Rail and ballast require a work train almost anywhere. Ties, on busy tracks or where sidings are few and far between, are more cheaply handled by train than by truck, but it is certain that large numbers of ties now distributed by work trains on branch lines and main

lines where the traffic is moderate can be handled very much cheaper and with equal efficiency by the foremen with their push trucks than by the use of a work train. This work is best handled in the winter time, when the section men can do it with the least detriment to their regular maintenance work.

Where but one car or so of small material, lumber, bridge material, rail and ballast is required at a time it can be handled by the local freights, arrangements being made with the despatcher to have them stop for the necessary time at the required point. It is cheaper to pay a little overtime to the local crew than to be compelled to pay a full day's charges for a work train.

Under the head of policing comes picking up scrap and ditching, operations in which tremendous amounts of money are wasted every year. Instead of devoting one or two days per month to scrap gathering with the work train, the same results can be obtained by making the various foremen take the scrap along their sections to their headquarters when they come in at night, and let the local freights handle two or three cars over the subdivision every two or three weeks. On these cars the accumulations are loaded by the section forces, the foremen arranging their work to suit the schedule of the train.

With regard to ditching, it is the opinion of the writer that the sodding of cuts will eliminate most of this work and that the greater part of the remainder can be handled by wheelbarrows more cheaply than by work train service. The amount of dirt which four or six men with barrows can move out of a cut in a day's time will surprise those who have never tried the experiment. Furthermore, these men will not have to cut and run for every train, nor do they have long runs to and from headquarters to cut into the working day. When conditions are such that a work train is a necessity for ditching, the local forces should first pile the dirt for loading, and then the train gang will be able to handle several times the amount of material which they could if it were not made ready for them.

In most emergency work a train is almost a necessity, but even in this line a saving can be made. A roadway car at headquarters loaded with ties and another with rail and small supplies can be sent to the scene of trouble on the wrecker or the first freight moving that way. Ordinarily this will put enough material on the ground to make repairs without the need of calling a work train. This also helps out the train operation, for every additional non-revenue engine around a wreck means more delay and bother when once the revenue traffic is resumed.

It is the opinion of the writer that supervisors should consider this problem most carefully, since large sums can be wasted so easily through lack of foresight. The work train is the easiest and least bothersome way to handle this work, but very often it is also the most expensive. As an example of how little work train service is really required, the writer has used a work-train 151 days in the last three years, or an average of 50.1-3 days per year, over half of which was consumed in ballasting new work or in repairing damages wrought by wrecks or the elements. This amount of work train service took care of all the requirements of 63 miles of single main track and of 13 miles of branch lines. On densely crowded main lines there will, of course, be much greater need of such service, but very few territories indeed are so heavily burdened with traffic that a goodly percentage of the work now done by the work train cannot be handled just as efficiently and far more cheaply in other ways. When the supervisor refuses to call out a crew unless the work cannot be done in any other way, he will be surprised indeed to find how few times he really needs the train and how great his savings in work train service will be in the course of a year.

RAILWAY CONSTRUCTION IN PANAMA.—The Republic of Panama has recently awarded to a New York firm the contract for the construction of a railway in the province of Chiriqui. The line will extend from Pedregal on the south coast, inland to David, and thence in two branches, one north to Boquete, and the other west to La Concepcion. The estimated cost is \$1,600,000.

Forms for Complete Rail and Ballast Records

A Discussion of the Advantages of and Methods for Keeping Such Information Accurate and Up to Date

By JAS. G. WISHART

Chief Draftsman, Chicago, Rock Island & Pacific, Chicago

Rail and ballast records are kept by a large number of railroads at the present time in a variety of different forms. Numerous requirements of various kinds have emphasized the necessity of adopting some simple, complete and accurate method of recording all the data concerning which it is desired to keep a permanent record. During late years more

should be kept there to insure greater accuracy. These forms will be described in the order of their use.

The three forms of reports mentioned are the daily telegraph report, the weekly form report and the monthly form report. The daily telegraph report is sent by the division superintendent to the chief engineer at the close of each day's work. It is sent as a telegram from distant points and by train mail from nearby points, and gives a full description of all work performed by gangs employed on rail or ballast work with the mile post limits and the amount of each class of work performed. On receipt of this report it is promptly entered on the form shown in Fig. 3. The principal purpose of this report is to keep the engineering and operating departments in close touch with the progress of the work. The information conveyed is not taken as final, owing to the liability of errors in transmission, and is used only in the chief engineer's office in compiling a weekly report for the operating department, showing the status of all work author-

WEEKLY PROGRESS REPORT.

Division. From 19 To 19

WIDENING ROADWAY.

AUTHORIZED	LINEAL FEET		MILE POST		HOURS			REMARKS
	ONE END	TWO ENDS	FROM	TO	STEAM SHOVEL	CRUSHER	TEAMS	
TOTAL TO DATE.								

BALLASTING.

TRACKS OUT	MILE POST	CUBIC YARDS BALLAST LOADED			BALLAST DISTRIBUTED		
		STEAM SHOVEL	CRUSHER	TEAMS	STEAM SHOVEL	CRUSHER	TEAMS
TOTAL TO DATE.							

RAIL RENEWAL.

DISTRIBUTED				RAIL RELEASED			
HOURS	FEET OF TRACK	KIND OF RAIL		HOURS	FEET OF TRACK	KIND OF RAIL	
		WEIGHT	NEW			WEIGHT	NEW
TOTAL TO DATE.							

Fig. 1—Weekly Report of Work Done

attention has been paid to gathering statistics on the life and comparative wear of rail of various sections and compositions and more care has been exercised in planning the yearly renewals than was formerly the case. The same may be said with reference to the yearly ballasting programs. For these purposes alone the charts and records described in the fol-

Report of Track Work done on _____ Branch District _____ Division _____

By _____ Road Master, During Month of _____ 19 _____

RAIL LAID IN MAIN TRACK

A. F. E.	Track Feet of Track	M. per Yd. and No.	Steel and Date	LOCATED BY MILE POSTS		REPLACES Weight and Number
				BEGINNING	ENDING	
				FEET WEST OF M. P.	FEET WEST OF M. P.	

RENEWAL OF RAIL IN SIDE TRACKS

A. F. E.	LOCATION	DESCRIPTION	Track Feet of Rail	RAIL LAID Kind of Steel T&A No.	RAIL TAKEN UP Kind of Steel T&A No.

BALLASTING

A. F. E.	KIND OF BALLAST	Depth under Tie	Feet of Track Ballasted	LOCATED BY MILE POSTS	
				BEGINNING	ENDING
				FEET WEST OF M. P.	FEET WEST OF M. P.

NOTE—The Superintendent will make report on this form and send to Chief Engineer by the 15th day of each month.

NOTE—This report must include only the work actually done in month indicated above.

CORRECT: _____ SUPERINTENDENT

Fig. 2—Monthly Report of Work Done Sent by Division Superintendents to Chief Engineer

lowing paragraphs will save the cost of their making and maintenance many times over.

For the proper maintenance of the records, three forms of reports and seven forms of charts are desirable, although some of these charts may be dispensed with in the case of roads with small mileage. These reports should preferably be made to the engineering department and the records

Progress Chart of _____ on _____ Division _____

M.P. _____ to M.P. _____ Total miles _____

A.F.E. No. _____

Date Completed	Partly completed	Date Completed	Partly completed	Date Completed	Partly completed	Date Completed	Partly completed
1		8		15		22	
2		9		16		23	
3		10		17		24	
4		11		18		25	
5		12		19		26	
6		13		20		27	
7		14		21		28	
Total		Total		Total		Total	

Fig. 3—Form for Summary of Daily Rail and Ballast Reports

ized or in progress. At the close of the season's work these reports are discontinued.

The form shown in Fig. 1 is the weekly report, which covers all work performed during the week and is sent in promptly on each Saturday night. The work as reported on this form is taken as authority and the charts are checked with it. Unlike the daily report this one includes any work performed by the regular section forces. All the columns are required to be filled out and where no work has been done the word "Blank" is written across the face of the form under each heading. This report is sent to the chief engineer by mail and is submitted by all divisions during the entire year.

Fig. 2 shows the form of monthly report rendered to the chief engineer by each division superintendent at the end of each month during the entire year. It shows the amount of work completed during the month and is the final report on completed work; when it and the weekly reports harmonize it is accepted as correct and entered on the progress charts shown in Fig. 4.

The above described reports are all that are necessary to

keep both the progress and permanent records up to date. In cases where the weekly report is not required of the chief engineer by the operating department, the daily telegraph report and the chart shown in Fig. 1 may be dispensed with. The weekly and monthly reports are printed blanks the size of a letter head. After being recorded on the charts they are filed in letter binders and preserved for future reference. It is particularly necessary in the acceptance of the above described reports to insist that at least the weekly and monthly reports check exactly with each other in the amount of finished work reported each month. When this is accomplished it is reasonably certain that the work has been correctly reported. A supply of blank forms for recording the daily reports should be furnished to each superintendent and instructions issued that the work done each day be platted on them before the daily report is sent in. By following this out faithfully, many errors in the reports will be avoided.

The five forms of chart record are as follows: A chart for recording the daily reports of rail renewal; a chart for recording the daily reports of ballast renewal; a chart for permanently recording the monthly reports of completed work;

tom of the sheets. These charts are not a part of the permanent record and are destroyed at the close of the work.

The permanent form of progress chart is shown in Fig. 4. When the weekly and monthly reports have been received and the figures check with each other, the information is platted on this chart in ink in the proper space. These charts are made on cross section tracing cloth divided 10 spaces to the inch and are made up new at the beginning of each year to show the progress of work during the current year. Blue line prints are furnished to the principal engineering and operating officials to enable them to keep in touch with the conditions on their respective territories.

Referring to Fig. 4, the heavy black line along the top of the chart is for the purpose of bringing out the location of stations and serves as a base for the chart. Immediately above this line are shown the station names, ten mile points, state lines and division limits. The ten mile points are platted on the heavy vertical lines of the cross-sectioning. Each chart is made up to show approximately 500 miles of line, this being a convenient length for handling in rolls. The scale horizontally is five miles to the inch. Immediately be-

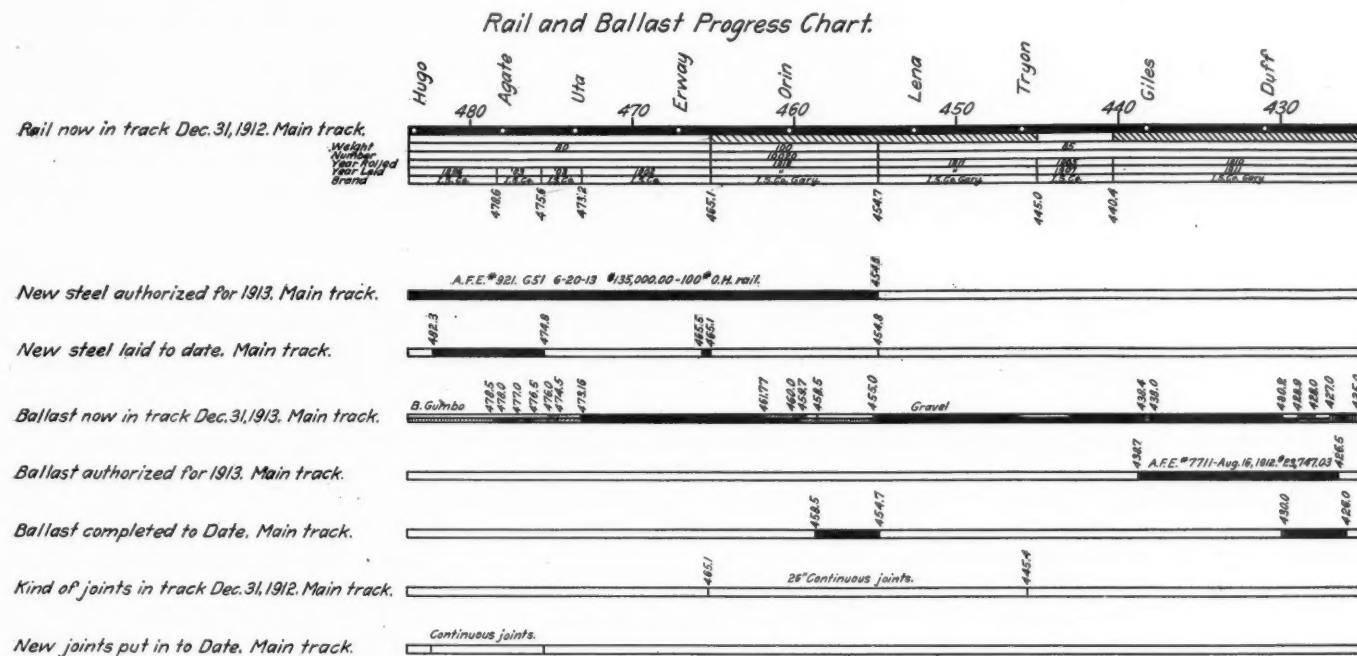


Fig. 4—Chart Showing Authorized Locations of New Rail and Ballast and Progress Made

a chart for permanently recording each year's rail renewals, and a chart for permanently recording each year's ballast renewal. Two forms of book records are also desirable, one showing the mileage of various kinds and weights of rail in track and the other showing the mileage of different kinds of ballast in track.

Fig. 3 shows the form of chart used for recording the daily reports of rail and ballast renewals. These charts are made letter size for convenience in handling and are platted on a scale of 1,000 ft. per in. horizontally. As the daily reports are received they are entered on this chart, the rail relaying being shown on one set of blanks and the ballasting on another set. The amount of rail laid on each side of the track is colored in with pencil between the reported mile post limits, the upper and lower of the three horizontal spaces being used to designate the two rails of the track. The ballasting reports are entered in the same manner, the horizontal spaces being used to designate the first, second and final lifts. For convenience in referring to the charts to ascertain the work completed each week, a distinctive color is used to show each week's work. The lineal feet of work completed or partly completed each day is entered in the blank table at the bot-

low the heavy black line are six horizontal spaces, each one-tenth of an inch in width and extending the entire length of the chart. These spaces are for recording the statistics of the rail in the track at the end of the previous year. The top space is for indicating the symbol for the kind of steel, the space being left blank where bessemer rail is located and hatched with a distinctive style for each other kind of steel; the next spaces below are for the weight of rail, mill section number, year rolled, year laid and mill brand or name. In the space for the weight of rail is also shown whether second hand, sawed or rerolled, no notation being made for new rail. The limits of the different kinds of rail are indicated by vertical black lines drawn through the six spaces and the mile post in hundredths of a mile is shown at the lower end. The next space below is provided to show the location of rail relaying authorized for the current year. This is shown by coloring in yellow between the mile post limits of the proposed work. The authority number, estimated cost, weight and kind of rail authorized and date of approval of the authority are also shown immediately above the coloring. The progress of the work is recorded in the next space below. As the work is reported completed this space is filled in with

a solid black line and the mile post limits shown. The weight of rail laid, section number, mill brand and year rolled are also shown immediately above the line. This information is obtained from the monthly report.

The ballast in track at the end of the previous year is entered in the next space. Distinctive characters of shading are used for each kind of ballast, thus making unnecessary any coloring of prints; in addition the names of the kinds of ballast are shown at intervals along the chart in conjunction with the shading. The next two spaces below are for indicating the authorized work and recording the progress of work being performed. These are kept in the same manner as those for the rail. The last two spaces at the bottom of the chart are for a record of the kinds of rail joints in the track and the kind applied to new rail laid.

The chart shown is made for single track, provision being made for the addition of spaces for a second track. These additional spaces should be placed in the blank portions of the chart, the spaces for both tracks carrying information of the same character being adjacent to each other.

The permanent rail record is shown in Fig. 5. This record is a condensation of the progress charts for all years from the commencement of the record. The spaces for recording rail data are similar to those at the top of the progress charts except that the space for recording the year laid is left off of all sets of spaces except the one for the record of rail in track at the beginning of the record. A space is also included for recording the kinds of joints. The upper set of spaces is for a record of the rail in track at the

These charts are made on plain tracing cloth for blue printing and all officials who desire are furnished with copies. The even five miles are shown by vertical lines ruled with red waterproof ink.

The main benefit of this record lies in the fact that it is a complete summary of all work performed within the time it

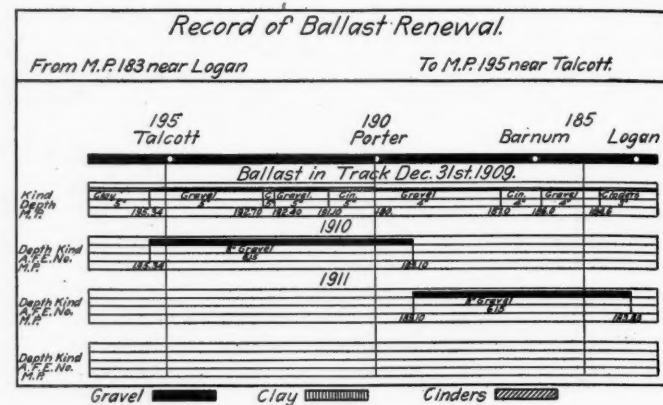


Fig. 6—Permanent Record of Ballast Work

has been in use. The total depth of ballast and the various kinds that have been applied at any point can be ascertained at a glance. This is information frequently desired, especially when making up authorities for expenditure for re-ballasting where a division of cost must be made for dis-

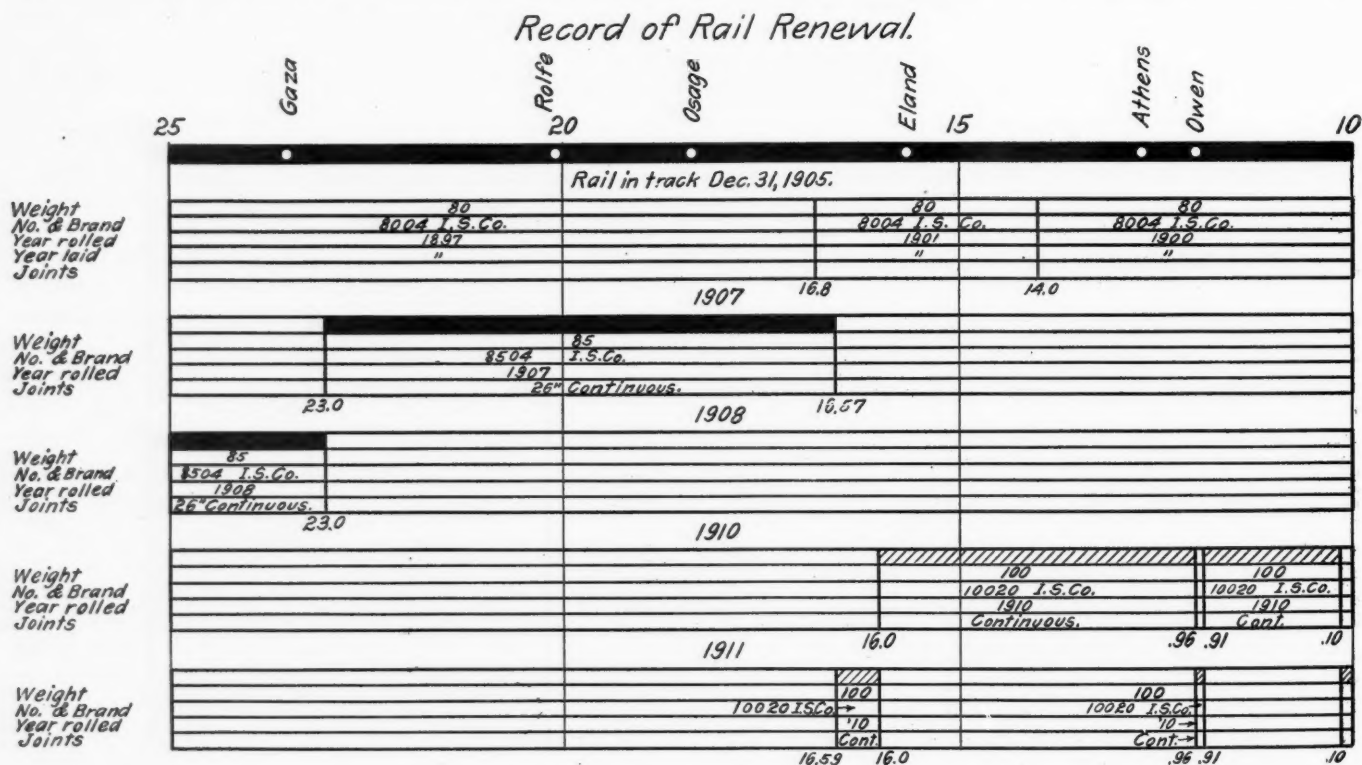


Fig. 5—Permanent Rail Record

time of starting the record. The sets of spaces below are for recording the work done each year, a separate set being used for each year in which work is completed. Fig. 6 shows a similar form for the ballast record. These forms are drawn on a scale of $\frac{1}{2}$ in. to the mile. One sheet 11 in. by 17 in., which is double a letter size, will show 58 miles of single track or 29 miles of double track. Station names, division points, state lines and the ten-mile points are shown along the upper edge of the sheets in the same manner as on the progress charts. The various kinds of rail and ballast are shown with the same symbols as on the progress charts.

tribution between the operating and addition and betterment accounts. This division of cost is regulated by the standard depth of ballast adopted by the railway company. Depths varying from 6 in. to 12 in. under the tie have been adopted by various companies. All ballast up to the standard depth is chargeable to addition and betterments and all in addition to that depth to operation. A set of these charts kept in the accounting department is a ready check against the distribution of charges on A. F. E.'s, which come in their reference.

Fig. 7 shows a form of book record for keeping a detailed account of the mileage of each kind, weight and age of rail in

the track and is used principally in connection with compiling the president's annual report, Interstate Commerce Commission reports and various other reports required by state commissions, officials of the road and others. For this reason the information is kept by states as well as by divisions. This record can also be made useful to the store department by enabling them to keep in touch with amount of various sections of rail in track, and thus determine the importance of carrying fittings for same in stock. The rail should be entered on these sheets

description is entered in the proper columns and the amount opposite same. Summary sheets are also made up at the end of each quarter, giving the mileage of each weight of rail and kind of ballast on each division, both for main line and branch line. At the end of the year the books are made over and the latest totals in track opposite each different kind of rail or ballast is transferred to the column headed Miles in Track, Dec. 31, 19.... When all of any kind has been removed from the track it is eliminated from the record sheets for the following

Progress Record of Rail Renewal 1911.
Northern Division.

Stations		Rail.						Miles in track	Jan. to March. Miles			Apr. to June. Miles			July to Sept. Miles			Oct. to Dec. Miles		
From	To	Wt.	Sec.No.	Brand	Rold.	Laid.	Dec.31/10	Laid	Remd	Intrk.	Laid	Remd	Intrk.	Laid	Remd	Intrk.	Laid	Remd	Intrk.	
Main Line.																				
West Bound	Track.																			
Chicago	Blue Manor	80	8004	I.S.Co.	1898	1898	0.68								.64	.04		.04	—	
		"	"	"	1899	1899	0.91								.78	.13		.13	—	
		"	"	"	1900	1900	0.12		.05	.07					.07	—				
		"	"	"	1903	1903	0.34					.10	.24							
		100	10001	"	1907	1907	5.18													
		"	"	"	1909	1910	.07													
		*	"	10020	I.S.Co.Gary.	1910	1910	8.70												
East Bound Track.																				
Chicago	Blue Manor	80	8004	I.S.Co.	1898	1898	0.70								.66	.04		.04	—	
		"	"	"	1899	1899	0.91								.91	—				
		"	"	"	1900	1900	0.12		.05	.07					.07	—				
		*	100	10020	I.S.Co.Gary.	1910	1910	7.87												
Chicago	Blue Manor	70	7005	Union	1886	1897	1.02													
Track #5	2nd Main	70	7003	N.C.R.M.	1887	1897	1.07													
		70	7003	I.S.Co.	1892	1897	1.55													
		*	Open hearth steel.																	

Fig. 7—Complete Record of Weights of Rail in Track

with all rail of the same weight grouped together, the lightest weight at the top of the sheet. Each weight should be arranged with the oldest rail first and the newest last in the group. With the rail information arranged in this manner the book record is of value in compiling the tentative yearly rail renewal program as the oldest and lightest rail on any line can be quickly found.

Fig. 8 shows a similar record for recording the ballast. These two forms, Figs. 7 and 8, are brought up to date at the end of

year. These records also serve as an absolute check on the new progress charts as they are made up each year.

Actual experience with the maintenance of a set of records, as described above, for the past seven years has shown innumerable occasions when they have been the means of saving considerable time. Reports of various kinds covering amounts of rail and ballast in track at certain times have been called for by officials and are also required by state and interstate commerce commissions. By the use of the charts and book records

Progress Record of Ballast Renewal - 1911.
Western Division.

Stations		In State of	Kind of Ballast.	Miles in track	Jan. to Mar.			Apr. to June.			July to Sept.			Oct. to Dec.		
From	To			Dec.31/10	Put in	Covered	Intrk.	Put in	Covered	Intrk.	Put in	Covered	Intrk.	Put in	Covered	Intrk.
<i>Main Line.</i>																
Davenport	St.Louis.	Iowa	Stone	116.29							8.24		124.53	17.11		141.64
West bound track.		"	Slag	1.49											1.49	—
		"	Gravel	24.33												
		"	Gumbo	5.00												
		"	Cinders	9.09												
		"	Sand and cinders.	17.82							.23	.886		1.47	7.39	
		"	" " dirt.	16.62							.20	17.62		7.69	9.93	
		"	" " "	16.62							7.81	8.81		6.46	2.35	
East bound track.		"	Gravel	24.33												
		"	Sand and dirt.	1.61												
St.Joseph-W ^Y	Union depot.	Mo.	Cinders	.02												
E.Wye to Union depot.		"	"	.02												
Altamont	Lena	"	B.Clay and cind.	13.27												
<i>Branch Lines.</i>																
Muscotine	Wilton.	Iowa	Sand and dirt.	11.61												
Camden	Stillings	Mo.	" " "	53.19												
Edgemont	Rushville	"	Gumbo	9.02												
		"	Sand and dirt.	15.63												

Fig. 8—Record of Ballast in Track

each quarter. The amount of rail taken out or ballast covered by another kind in each quarter is entered in the second column and the amount left in the track in the last column opposite the description as entered in the columns at the left side of the page. The new material put in in each quarter is entered in the same manner in the first column under the quarter and the total in track in the last column. Where rail or ballast of the same kind as put in does not appear on the page, the full de-

these reports have been worked up in but a fraction of the time which would have been required in the absence of same.

RAILWAY LINES IN THE BRITISH EMPIRE.—The total length of railway lines opened for traffic in the British self-governing dominions, Crown colonies, possessions and protectorates at the close of 1912 was 98,023 miles, an increase of over 30,000 miles in 10 years.

CREOSOTE OIL*

By P. C. REILLY

President, Republic Creosoting Co., Mobile, Ala.

The term creosote oil should be a specific term denoting a material obtained from a specific source. As applied to a wood preserving material its use should be restricted to distillates obtained from coal tar. It should not be applied to the distillates obtained from petroleum tar, nor should it be applied to the mixture of creosote oil with tar, petroleum, asphalt, resin or other substances. Originally, and until quite recently, the term was accepted as exclusively describing a coal tar distillate, but the adulterations of creosote oil within the last decade, and more especially within the last six or seven years, have brought an abuse of the term and have removed from it the definiteness it originally possessed—a definiteness which should be again restored to it.

In mixing creosote oil with tars, petroleum, resin, asphalts or other substances, the resultant material is an article quite different from the coal tar distillate. Because they do not in any way closely approximate the coal tar distillate, the petroleum distillates should be listed under some distinguishing name, and, similarly, the mixtures above referred to, or any other mixtures, should be listed under distinguishing names; neither the petroleum distillates nor the mixtures should appropriate the name creosote oil, and neither should be sold or used as creosote oil. Therefore, when I refer to creosote oil, it shall be understood as referring to a product obtained by distillation from coal tar.

In distilling coal tar the first distillates, and they distill over simultaneously, are the ammoniacal liquor and zenzol. The distillates following are taken as a whole and constitute the oil known as creosote oil. If the objective material of the coal tar distiller is a very hard pitch, such as target pitch, core pitch, etc., the distillation of the tar is carried to a high degree of heat, the quantity of creosote oil obtained is the greatest and it contains the largest percentage of high-boiling point oils; if the objective material is a roofing pitch, which is softer, the tar is not distilled to so high a heat, the quantity of creosote oil produced is less, and the percentage of the volatile oils in the distillate is much larger than in the distillate obtained in the manufacture of hard pitch; if the objective material is a paving pitch, which is softer than a roofing pitch, and very much softer than hard pitch, the distillation of the tar is concluded at a much lower temperature, the quantity of creosote oil produced is much less and the percentage of the volatile oils, in the distillate is still larger. These three oils I shall respectively grade in quality for wood preserving as superior, inferior and very inferior. The percentage of the distillate in the above pitches is substantially as follows:

In manufacturing a paving pitch the percentage of oil obtained is approximately 10 per cent. of the tar. We will consider this 10 per cent. as volatile oil. In the manufacture of the roofing pitch, the percentage of oil obtained is approximately 20 per cent. and we shall consider this as one part volatile and one part good oil; in the manufacture of the harder pitches, the percentage of oil obtained is approximately 40 per cent., and we will consider this as one part light oil, one part good oil, and two parts of the best oil. These figures substantially represent the average per cent. of the distillate obtained in the production of the different pitches. Of course they will vary, depending on the different grades of tar distilled, but the ratio of the light oil to the better oils in the roofing and hard pitches will remain substantially as stated. It was the custom, and in many manufacturing places it is still the custom, to sell either of these oils, or a mixture of the two, or a mixture of all three, as creosote oil. The product creosote oil, therefore, bears no relation to quality.

The wood preserving industry is growing so rapidly, the results now expected are so exacting, and creosote oil is so

important a factor in the success of the industry, that it is essential from the scientific view point, as well as the buyer's and seller's view point, that creosote oil should be indicative of one material and within a reasonable range, indicative of the quality of the material.

When we reflect upon the uncertainty of the present quality of creosote oil, and the indifferent method of producing it, we are astonished rather at the success had from its use than that there have been many failures. But unless progress is made in the quality of the oil used, the percentage of failures will be greater hereafter, because of the wider range of work to be done and because of the many different kinds of oil being used under the term creosote oil. The industry is now too important and too large, with every prospect of growing in importance and extent for it to continue to place its reliance upon either an uncertain or an inferior quality of creosote oil, or upon a material obtained from an uncertain source or composed of materials from several sources. We can only get definite and uniform results by using a distillate oil from one source, and that source coal tar.

If 20 lb., 16 lb., or 12 lb. of oil, to the cubic foot, is used for the preservation of lumber, it is assumed that the specified quantity shall always be necessary to get the full mechanical wear of the lumber in its original strength. If the lumber immediately after treatment and before use shows the full treatment, but after exposure for a few years shows a considerably less quantity of oil, due to volatilization, it is deficient treatment, and will bring failure. The occasion for replacing treated timber because of decay should never occur; and by bringing the wood preserving industry to a proper business standard it shall not occur.

The lack of the basic high boiling oils in most of the commercial creosote oils is known, and I have sometimes thought that the need of these heavier basic oils explains the adulteration of creosote oil with tar and other viscous substances; and that these adulterants were used on the mistaken theory that they supplied the known deficiencies of creosote oil. Such mixtures, however, instead of supplying the need and of improving the oil affect its quality adversely. A stable creosote oil can be produced from coal tar. This oil, as is known, is practically indurctible and unchangeable; and it will penetrate the timber at low pressure and at low heat.

A proper specification for creosote oil for tie and timber work should provide for a pure coal tar distillate of which none should distill below 210 degrees C., and not more than 50 per cent. should distill below 315 degrees C. This is by no means the highest grade of oil for the purpose, but is a step in the right direction; and it is not so radical a step as to prevent its practical application immediately.

The four essential features desired in an oil used for wood preservation are penetrability, stability, preservativeness and waterproofness.

The depth to which an oil will penetrate a porous body depends upon the physical properties of the oil, and the size and construction of the cavities in the solid body. The oil must be in a liquid state, and of such a consistency that the particles will move freely upon one another if the best results of penetration are desired.

If an oil is composed of a mixture of several materials which differ widely in the mobility of the particles, the penetration of the more limpid materials will be decreased by the amount of resistance imposed by the more viscous matter. Creosote oil has a high penetration co-efficient while tar has a very low one. The degree of penetration also depends upon the temperature of the liquid, the higher the temperature (within certain limits) the freer the liquid will flow and the more easily it will enter the pores of the solid material, which it penetrates.

The stability of a preservative oil depends on both its chemical and physical properties. If the substance as a whole contains portions that are very volatile and on exposure much of the material is lost, or if it is of a light specific

*Abstract of a paper read at the annual meeting of the American Wood Preservers' Association at New Orleans on January 20, 1914.

gravity and is exposed to moisture and to rain, as is the case with most treated timber, much of the oily and soluble portion of the preservative will be leached out from the wood and then leave the fiber unprotected. On account of their high specific gravity, their high boiling point, their slight solubility in water, and the strong chemical union of the compounds composing this material, the heavy creosote oils render it very stable and durable under all conditions required of a wood preservative. The insolubility in water and the high specific gravity prevent its removal by such forces as rain or tides, and its high boiling point renders it but slightly volatile, in the strongest heat of the sun.

The preservative value of an oil may depend upon several properties, both chemical and physical in nature. It may contain an antiseptic or poisonous constituent. It may be capable of adhering to the cell walls and fiber of the wood with such permanency as to prevent conditions favorable for the development or existence of elements destructive to the timber. It may consist of a viscous material which will deposit a film on the external surface of the material to be preserved, and thus prevent the egress or ingress of any destructive elements. The prevention of decay by the use of antiseptics may be lasting or temporary, depending on the character of the antiseptic material used. An ideal means of preservation is by a combination of the first and second processes mentioned; that is, an antiseptic combined with some stable oil which will adhere to the cell walls and fibers of the wood to be preserved. By such a preservative all organisms are killed at the time of treatment of the timber and the fiber is surrounded by the coating of oil in such a way as to prevent the attack of any organism. In the light creosote oils we find the antiseptic elements predominate. These elements, as well as the oil, are quite volatile, are of low specific gravity, and are water-soluble to a considerable extent, all of which makes the material as a whole only a temporary preservative.

The heavy creosote oils contain sufficient antiseptics of the higher and more stable homologues of the light oils to effect destruction to any vegetable or animal organism existing in the wood, and the heavy oil which makes up the main body of the material is of such nature as to offer very effective resistance to the invasion of external organisms, air and water.

Waterproofing can be accomplished by coating the cell walls with a heavy creosote oil which will leave a waterproof film so firmly adhering to the wall of all the cavities that moisture is excluded from the cells. The most stable and penetrating liquid should be used for effecting this feature of wood preserving. It is evident a light oil would soon volatilize to such an extent as to be almost useless as a waterproofing medium.

In wood preservation, we have two commodities to deal with—one, nature's product, timber, which itself cannot be changed; the other—creosote oil, man's production, which he can control, and which he must bring up to the necessary quality to get the greatest efficiency. First costs are now so great that no improvement can be viewed as a temporary installation; and this is surely applicable to the use of preserved wood, because of the decreasing supply of timber. If a creosote oil were adopted of such a quality that the original injection into the timber remained in the timber, and the lumber was sufficiently treated, the preservation of the timber would be permanent, and this should be the goal sought by those engaged in the wood preserving industry.

NEW BOSNIA-HERZEGOVINA RAILWAY.—The scheme for proposed railway development in Bosnia and Herzegovina includes the construction of a standard gage line from Samac to Dozov and the widening of the line from the latter place to Sarajevo. A more direct route will thus be provided between the Hungarian state railway system and Dalmatia, and there will undoubtedly be an increase in both passenger and freight traffic between Hungary and Bosnia. The latter, however, will pay but a small portion of the cost.

PREVENTION OF WATER WASTE ON RAILROADS

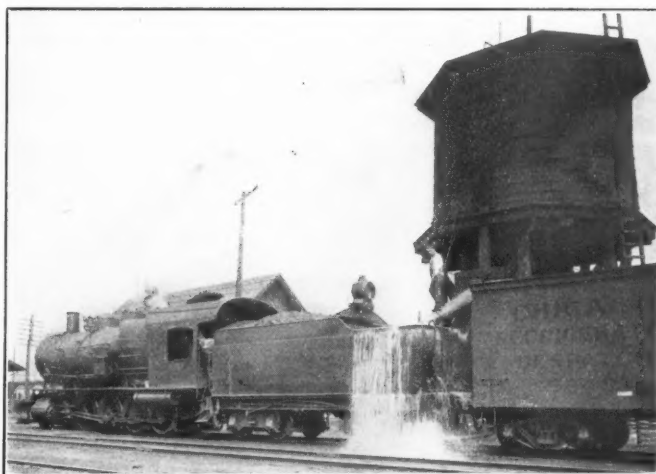
By C. R. KNOWLES

General Foreman of Water Works, Illinois Central R. R.

The problem of the prevention of water waste is not a new one by any means as it engaged the attention of waterworks men long before railroads were built. The ancient Romans struggled with a heavy loss of water from the costly aqueducts that supplied Rome with water over 2,000 years ago, and the same problem has continued to engage the attention of waterworks men up to the present time. Chicago, Washington, New York and a number of other cities have spent thousands of dollars in the detection and prevention of water waste, and the result has been a saving of many times the amount so expended.

The consumption of water by railroads has grown to such an extent that the question of water waste has become one of great importance in the interest of economical operation, and a continuous effort should be made to prevent unnecessary waste of water.

The prevalent idea is that water is as free as air and so it is to a certain extent in our lakes, rivers and other natural sources of supply. The value of water is fixed by the cost of delivering it ready for use, and in event the water in its natural state is unfit for domestic or industrial use there is an added expense for



Overflowing an Engine Tender Tank

treating or purifying it. The general impression that water is of little value has resulted in a certain carelessness in its use, resulting in waste and a corresponding increased expense that could easily be avoided.

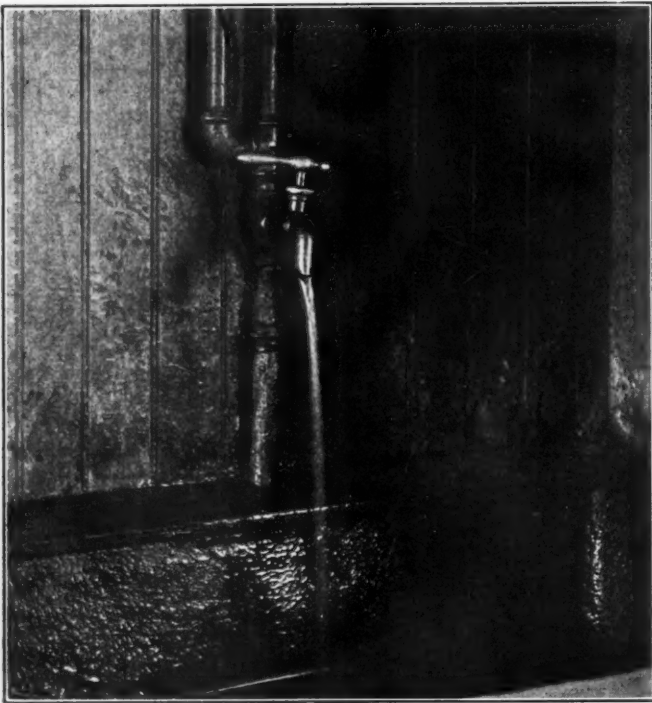
The causes of water waste on a railroad are many, and it is within the power of almost every employee to effect a saving for the company in this respect. The waste in taking water at tanks and penstocks causes a heavy loss as large quantities may be lost in this manner each time water is taken, especially in tenders with circular manholes, unless care is exercised to properly spot the engine and prevent overflowing the tender.

The average amount of water taken by the larger engines is about 5,000 gal. To show the large expense that might be incurred on account of such waste I have assumed that if but one-fourth of this amount be wasted each day at each of the 460 principal tanks and penstocks on the system, the annual loss on this account would amount to about 210,000,000 gallons, which at five cents per thousand gallons means a loss of \$10,500 per annum for the value of water alone. In addition to this there is the cost of removing ice from tracks in the winter months, and the cost of track work due to soft track caused by the water waste. The cost of removing ice from tracks at 250 tanks and penstocks on northern and western lines is approximately \$6,000 per annum, these figures being based upon 2½ hours of one man's time

clearing the track of ice at each tank or penstock for 60 days of each year. A conservative estimate of the work necessary to repair soft track caused by water waste from tanks would be one-half hour per working day, or 156 hours per annum at each tank or penstock, making a cost per annum on the system of nearly \$11,500. This means a total annual expense of \$28,000, or an average annual cost of \$60 for each point where water is taken by locomotives. The total amount wasted annually in this manner is equivalent to 5 per cent. on \$560,000, and would buy 22 locomotives or 230 standard water tanks of 100,000 gal. capacity.

Another loss in connection with water tanks is due to overflowing the roadside tank, and to leaking tank valves. Fortunately a leak of this kind is generally very conspicuous, and should be remedied before any large amount of water is wasted, but even here there is room for improvement. With tanks in southern latitudes it is necessary to occasionally overflow the tank in order to tighten the joints between the upper portion of the staves of the tub, and the pumper should not be charged with waste in such cases.

One of the worst wastes at terminals occurs in connection with the use of boiler washout hose and valve. The water used for washing boilers invariably has to be handled twice, and to secure the desired results a high pressure is required, making the cost of this water average 10 cents per 1,000 gal. Unless care is taken a boiler washout hose with a one inch nozzle at 100 lb. pressure will easily waste 12,000 gal. of water per hour, costing \$1.20, and this does not take into consideration the cost of heating where hot water is used for washing. It has been observed to be the practice at certain roundhouses for washout hose to be carelessly stuck in a washout hole and the water wastes through

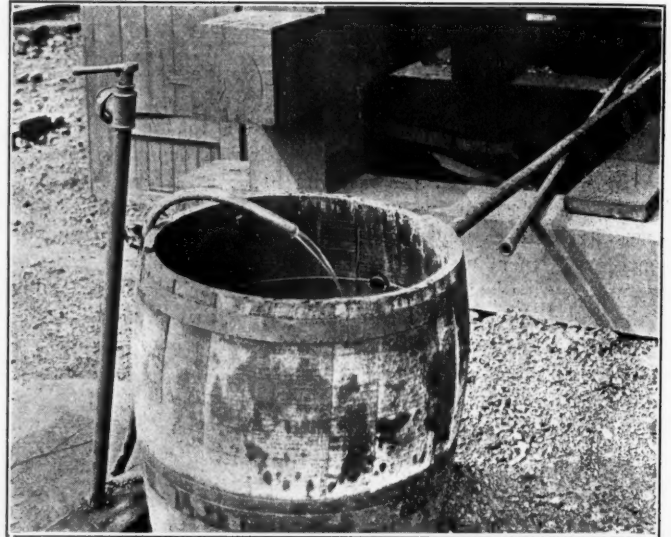


A Running Faucet in a Battery Room

the open washout holes without benefiting the condition of the boiler in the least; or, worse yet, the hose may be running in the pit. It is an expensive man, indeed, whose time is too valuable to permit devoting a minute or two to closing a washout hose valve when not in use. Assuming each of the 1,600 active locomotives owned by the Illinois Central and Yazoo & Mississippi Valley are washed once a week, and water to the value of 25 cents is wasted in the washing of each engine, the total annual loss amounts to \$22,100, which capitalized at 5 per cent. represents an investment of \$442,000, a sum sufficient to equip every roundhouse on the system with a first class boiler washout

system. It is not asserted that this waste occurs on every engine, but the figures are given to indicate the large loss that can arise if proper supervision is not exercised.

Laws prohibiting the use of public drinking cups have made the bubbling drinking fountain a necessity in a great many instances, but the makeshift affairs constructed of $\frac{1}{2}$ in. to $1\frac{1}{2}$ in. pipe, and flowing constantly, are an abuse to this system of providing drinking water, and will waste from \$150 to \$350 per year for each fountain. An installation of 5 or 10 of these makeshift fountains without self closing valves may mean an annual loss of \$750 to \$3,500. The actual amount of drinking



A Running Stream Used for Filling Jugs

water required by a man is about $\frac{1}{2}$ gal. per day. A single bubbling fountain with a $\frac{1}{4}$ in. opening at 25 lbs. pressure will deliver 425 gal. per hour, which would furnish ample drinking water for 10,000 men and allow 50 per cent. waste. The only satisfactory method of controlling this waste is by equipping all fixtures of this kind with self closing valves.

Yard hydrants for sprinkling, filling water jugs, coach yard service, etc., cause a heavy waste of water. A one inch hydrant of this type will waste from 20 to 30 cents worth of water per hour, or \$5 to \$7 per day. Forty or 50 of these hydrants are often installed in one coach yard, and as a number of them are always running the loss is enormous. The writer has often seen 40 gal. wasted in securing a drink of water, amounting to perhaps one-half pint. Frequently a hose attached to one of these hydrants is carelessly thrown down by an employee who will allow the water to waste rather than walk 30 ft. to close a valve.

Leaking valves in a toilet flush tank will waste from \$3 to \$30 per month, depending on the number of fixtures. A case was found recently where toilet facilities at a terminal were causing a loss of water amounting to over 150,000 gal. per day at a cost of \$150 per month. Wash basins, slop sinks and other fixtures connected direct to sewers and drains offer opportunity for heavy waste, and a saving can be made in almost every instance by giving attention to valves and faucets, and making it a point to see that they are closed when not in use.

Another source of waste is the many unauthorized service lines whose location is unknown, and which when laid in sand, cinders, porous earth or close proximity to sewers, may leak for years without any indication of the leak appearing on the surface. These lines are often laid without proper authority, or without the knowledge of the waterworks department, and consequently there is no record. It is impossible to estimate the loss from these "wildcat" service lines, but there is no question but what they cause a constant and heavy expense. The remedy for this loss is to lay only such lines as are necessary under the supervision of the waterworks department, after proper authority has

been secured, and to see that a record is kept of the location of all such lines.

The sources of waste above mentioned are only a few of the many on a great railway system, and the drip, drip, drip of the leaking faucet, while apparently insignificant in itself, goes to make up a part of a very heavy loss due to water waste.

If those who use water, as well as those who supervise such use, will remember that water is no more free than oil, coal and other supplies, and that the cost of supplying water runs into hundreds of thousands of dollars per annum, they will realize the necessity for economy in its use.

HAGERSVILLE BALLAST CRUSHING PLANT OF THE MICHIGAN CENTRAL

The possibility of a railway company producing crushed stone for ballast at a low cost by operating its own quarry and crushing plant is well illustrated by the experience of the Michigan Central which has in service two large quarries, one located at Joliet, Ill., and one at Hagersville, Ont. The plant at Hagersville, which is on the main line about 80 miles west of Buffalo, has been operated for about nine years with unusually good results. The stone is overlaid with from 1 to 4 ft. of earth which must be stripped, and at present the pit has been worked to a maximum depth of about 29 ft. At this depth the surface water causes some trouble in wet seasons so that at least for the present, it is not advisable to go lower.

The past season included only 190 working days, as it was cut short on September 18 because of the necessity for stopping ballasting operations. Nearly two months of the best period of the year for the operation of a quarry was thus lost, and on account of the early date of opening, January 15, when the weather was at times very unfavorable for the economical operation of the plant, the results are not as favorable as they would have been had the season begun later and continued to its normal close. All of the following cost figures are based on this season of 190 days.

The drilling and blasting is done by about 10 men using four air drills. The holes are driven to a depth of 10 to 15 ft. ordinarily, the natural break in the rock carrying the force of the explosion to a depth of about 20 ft. On account of the high price of dynamite in Canada, blasting powder is used wherever the water does not prevent. The quarry face is served by 40 four-ft. gage tracks, and about 40 men are employed in loading the stone into Austin automatic dump cars holding an average of 3 yds. The quarry tracks converge from three sides to the crusher plant, three tracks being carried up an incline to the dumping floor over the crushers. This track arrangement prevents congestion of cars at the crusher and saves considerable time. The haul from the quarry face to the crusher plant varies from 75 to 150 yds. About 20 cars are required for handling stone to the crusher and five horses are used in pulling these cars in to the foot of the incline, each horse pulling only one car. An Austin friction hoist hauls the cars up the incline to the dumping floor.

The crushing plant consists of two Austin crushers, a No. 5 and a No. 7½, the crusher run stone varying in size from ¾ in. to 2¼ in. The power for operating these crushers is furnished by a steam plant including two 75 h. p. boilers and one 150 h. p. engine. Five men are used in the crusher building, and a fireman and an engineer are required in the power house. A locomotive with engine crew, one brakeman and two laborers are used in spotting and loading the Rodger ballast cars.

In addition to the men mentioned above, two men and a foreman are required on track repairs, and two foremen, a timekeeper and a superintendent are employed to supervise the operation of the plant. Including men engaged in stripping, pumping and other odd work about the quarry, the total force usually includes about 80 men. Prior to the last season the

men were getting \$1.75 a day, but went on strike for \$2. In the settlement, piece-work was adopted for the loaders which allows some of them to make as high as \$3.50 a day. It is hoped that the drilling and blasting can be put on piece-work next season. The current rate for common labor in the vicinity of this quarry is \$2 or \$2.25. All of the labor used is foreign, the nationalities being kept well mixed to eliminate as much trouble as possible. The foremen receive \$82.50 per month. The detailed cost of operating the quarry and the crusher plant for the past season, from January 15, 1913, to September 18, inclusive, was as follows:

	Total cost.	Cost per cu. yd.
Loading stone in quarry.....	\$15,857.97	\$0.112
Hauling stone to crusher.....	6,363.12	0.04494
Drilling and blasting	11,344.93	0.08012
Crushing and loading ballast.....	9,398.11	0.06637
Supervision, repairing and pumping...	3,562.57	0.02516
Miscellaneous	1,803.93	0.01274
Hauling and spotting ballast.....	13,817.85	0.11449
Unloading ballast	1,419.10	0.01176
Ballasting	35,180.85	0.29145
		\$0.75903

The total amount of stone crushed at Hagersville was 141,589 cu. yds., or about 745 yds. per day, of which 120,688 cu. yds. was used for ballast. The cost per cubic yard of this ballast loaded on cars at the crusher was \$0.34133, the average haul of the ballast was 129.07 miles, and the total cost of the ballast in track was \$0.75903.

This quarry and crushing plant is operated under the supervision of the engineering department, of which George H. Webb is chief engineer. D. Thompson is supervisor of quarries, and D. E. Cronin is directly in charge of the Hagersville plant. We are indebted to all of these gentlemen for the above information.

COMMITTEE APPOINTMENTS OF THE BRIDGE & BUILDING ASSOCIATION

We give below the organization of the committees of the American Railway Bridge & Building Association for the coming year, which has just been issued:

COMMITTEES ON SUBJECTS FOR REPORT AND DISCUSSION, 1913-14.

Ice houses and the preservation of ice for railway service.—C. E. Smith, chairman, Mo. Pac., St. Louis, Mo.; A. Ridgway, D. & R. G., Denver, Col.; W. A. Pettis, N. Y. C. & H. R., Rochester, N. Y.; G. A. Manthey, M. St. P. & S. S. M., Minneapolis, Minn.; G. S. Kibbey, M. & St. L., Minneapolis, Minn.; J. F. Parker, A. T. & S. F., San Bernardino, Cal.

Warnings for overhead and side obstructions.—E. G. Storck, chairman, P. & R., Philadelphia, Pa.; M. M. Barton, P. R. R., West Philadelphia, Pa.; F. E. Schall, Lehigh Valley, So. Bethlehem, Pa.; T. E. Thomas, B. & O., Wilmington, Del.; E. S. Meloy, C. M. & St. P., Chicago.

Railroad crossing gates, towers, etc.—G. H. Jennings, chairman, E. J. & E., Joliet, Ill.; F. E. Weise, C. M. & St. P., Chicago, Ill.; F. W. Tanner, B. & O., Baltimore, Md.; P. Aagaard, I. C., Chicago, Ill.; O. F. Barnes, Erie, Susquehanna, Pa.

Reinforced concrete bridge work.—O. F. Daltrom, chairman; C. & N. W., Chicago, Ill.; I. L. Simmons, C. R. I. & P., Chicago, Ill.; L. D. Hadwen, C. M. & St. P., Chicago, Ill.; J. A. Bohland, G. N., St. Paul, Minn.; A. Montzheimer, E. J. & E., Joliet, Ill.; C. J. Scribner, C. B. & Q., Chicago, Ill.; D. C. Zook, Pa. Lines, Ft. Wayne, Ind.

Station buildings for passenger service.—M. A. Long, chairman, B. & O., Baltimore, Md.; E. B. Ashby, L. V., New York City; G. W. Andrews, B. & O., Baltimore, Md.; K. Peabody, N. Y. C. & H. R., New York City; R. McKibben, P. R. R., Altoona, Pa.

Mechanical coaling stations.—A. O. Cunningham, chairman, Wabash, St. Louis, Mo.; F. G. Jonah, St. L. & S. F., St. Louis, Mo.; C. H. Fake, M. R. & B. T., Bonne Terre, Mo.; J. S. Berry, St. L. S. W., St. Louis, Mo.; R. J. Bruce, M. P., St. Louis, Mo.

Care of traffic while constructing bridges to eliminate grade crossings.—G. T. Sampson, chairman, N. Y. N. H. & H., Boston, Mass.; R. H. Reid, L. S. & M. S., Cleveland, O.; J. P. Canty, B. & M., Fitchburg, Mass.; W. F. Strouse, B. & O., Baltimore, Md.; F. E. King, C. M. & St. P., Minneapolis, Minn.; W. H. Wilkinson, Erie, Elmira, N. Y.; H. U. Smith, W. & L. E., Cleveland, O.

Water supply.—C. R. Knowles, chairman, I. C., Chicago, Ill.; J. B. White, C. & N. W., Boone, Iowa; Jas. Dupree, C. T. H. & S. E., Crete, Ill.; John Ewart, B. & M., Boston, Mass.; C. F. Warcup, G. T., St. Thomas, Ont.; M. G. Manning, C. G. W., Ft. Dodge, Iowa.

Concrete culvert pipe and concrete piles.—F. L. Burrell, chairman, C. & N. W., Fremont, Neb.; H. Rettinghouse, C. St. P. M. & O., St. Paul,

Minn.; H. H. Eggleston, C. G. W., Des Moines, Iowa; Edw. Murray, C. M. & St. P., Miles City, Mont.; S. T. Corey, C. R. I. & P., Chicago, Ill.

Heating, lighting and ventilating roundhouses and shops.—W. M. Cardwell, chairman, Wash. Term., Washington, D. C.; G. W. Hand, C. & N. W., Chicago, Ill.; F. M. Griffith, C. & O., Covington, Ky.; E. E. Clothier, C. M. & St. P., Malden, Wash.; F. L. Thompson, I. C., Chicago, Ill.

Concrete posts, poles and signs.—G. E. Boyd, chairman, D. L. & W., Buffalo, N. Y.; A. S. Markley, C. & E. I., Danville, Ill.; O. W. Wright, Long Island, Jamaica, N. Y.; F. J. Conn, C. N. O. & T. P., Lexington, Ky.; W. E. Elder, C. B. & Q., Burlington, Iowa.

REPORT OF CREOSOTED PILING IN SANTA FE GALVESTON BAY BRIDGE

F. B. Ridgway, chemist, International Creosoting & Construction Company, Texarkana, Tex., read a paper before the convention of the American Wood Preservers' Association at New Orleans on January 20, from which the following is abstracted.

In 1875 the Santa Fe contracted for a number of creosoted southern yellow pine piles to be used in the construction of a trestle across Galveston Bay. No record was kept of the method of seasoning the piles or of the amount of creosote injected, but the amount of oil injected was probably somewhere between 8 and 12 lb. per cu. ft. of timber. This treatment was considered light at the time and later a number of these piles were treated with the maximum amount of oil which could be injected with the facilities then in use.

The results obtained from these piles treated in 1875 were sufficiently good to warrant the use of creosote piling in the

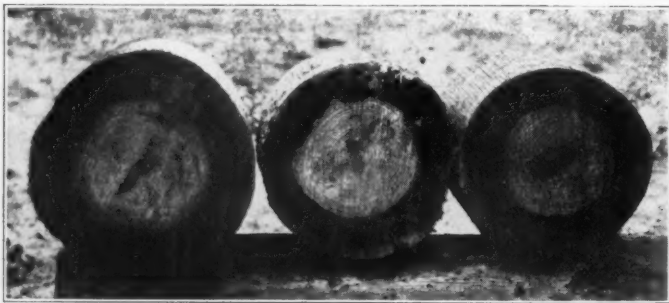


Fig. 1—Air, Water and Mud Sections of a Pile Treated in 1875 Not Attacked by Borers

reconstruction of the trestles in 1895. Although many of these original piles were still in good condition, none of them were used in the new construction. However, they were not pulled but were left standing between the bents of the new structure. After the opening of the new causeway in July, 1912, the old structure was dismantled, this work being completed about the middle of the past summer. At the same time the piles inserted in 1875 were also removed, and while they were in actual service only 20 years, as they were left standing in the water they served as a test for 38 years.

On examination after removal it was found that the air sections of these piling were very light in color and had almost entirely lost every outward appearance of ever having been creosoted. In many instances the heart of the air sections of the stick were badly decayed, although the outer portions were sound. In other instances, although not more than 50 or 60 per cent. of the stick had been penetrated by the oil, the heart as well as the outside portions was sound. This difference in condition was due to the fact that on certain of the piles sufficient of the butt of the pile was cut off after driving to expose the untreated center of the stick, and in consequence decay had started, while in other cases the piles had been driven sufficiently deep that it was unnecessary to cut off the end of the pile below the treatment. The water sections of the piles treated in 1875 were in most cases more or less attacked by the teredo and limnoria. In many cases these sections of the piles were almost completely eaten away, although in a few cases the water section was in a practically sound condition.

Fig. 1 shows air, water and mud sections of one of the good 1875 piles. The water section is taken just below the water line at the point of greatest activity of the marine borers. The other two sections are taken at sufficient distance from the ends of the stick to show only radial penetration of oil and to be free from the longitudinal penetration from the end of the stick. This pile is approximately 14 in. in diameter and shows a 3 in. penetration of oil. Fig. 2 shows three similar sections of one of these piles which was almost entirely eaten away. This pile is approximately 11 in. in diameter, with a 3½ in. penetration.

As rebuilt in 1895, the trestle was about two miles in length



Fig. 2—Air, Water and Mud Sections of Badly Eaten Pile Treated in 1875

and contained 751 bents with a total of 3,107 piles. The depth of water ranges from a maximum of 9 ft. at mean low water to a very shallow depth at the edges. Among the piling driven were 110 red cedar piles which were given a light injection of creosote oil. The remainder were strictly long leaf yellow pine creosoted according to contract with 24 lb. of oil per cu. ft. of water. They were driven in good condition and none were shattered. These piles were furnished by the predecessor of the International Creosoting & Construction Company, and were treated at Galveston.

The pine piles were treated in the green state, the majority of them coming direct from the stump. They were seasoned by steaming which was regulated entirely by pressure with no attention given to temperature. Only saturated steam was used in direct contact with the wood with superheated steam in the coils in the bottom of the treating retort during the entire steaming and vacuum process. For the first 24 hours the steam pres-

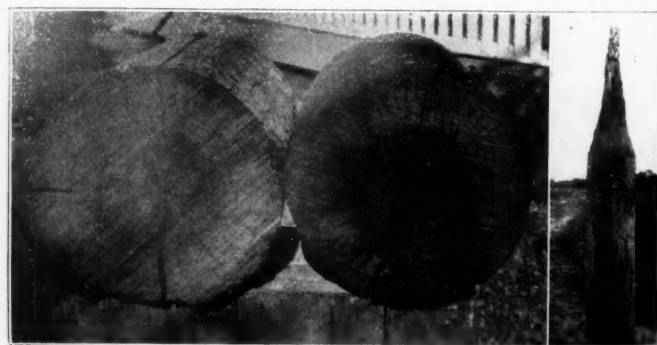


Fig. 3—Water and Mud Sections of 1895 Pile Not Attacked by Borers

Fig. 4—Untreated Pile Completely Eaten Off

sure was maintained at 55 lb., and for the remaining 12 hours at between 47 and 50 lb. After steaming, a vacuum was maintained for four hours, after which the retort was filled with oil which was forced into the timber under pressure until the 24 lb. per cu. ft. had been injected. These piles were treated under a 10 year guarantee by which the creosoting company was to replace, free of charge, any pile found defective at the end of that time. However, not a single pile had to be replaced.

At the time of the 1900 storm, a steamer was driven through the trestle, breaking off a number of piling and requiring 270 piles to be replaced. This storm so seriously damaged the trestles of the Southern Pacific and the Galveston, Houston & Henderson that they were abandoned and all rail traffic into Galveston was carried over the Santa Fe trestle.

After dismantling the trestle most of the material was assembled in the Santa Fe timber yard at Somerville, Tex., although some piles were redriven immediately in other structures on the division. Although some piles in shallow water were broken off in pulling, making it impossible to secure an actual count of all the good and defective 1895 piling removed, it was estimated that less than 10 per cent. of these piles pulled were unfit for use in other work.

Fig. 3 shows a view of the water and mud sections of one of the 1895 piles which was not attacked by borers. The checks shown in the photograph were not present when the pile was pulled several months previous. Fig. 6 shows a view of one of the poorest of these piles which was attacked by the teredo alone. This pile is extremely resinous in character and the penetration of the oil is comparatively poor, especially on the side attacked.

Fifty-three of the 110 red cedar piling were located in Somerville yard, 50 of which had been broken in pulling. Some of these piling were used at Brownwood and reported in perfect condition. Red cedar is a very difficult wood to treat, it being impossible to inject any large amount of oil into it. Since the records were lost in the Galveston storm it is not known just

that in many instances where a pile has been attacked, the borers have entered the wood through knots, and it is further noted that most of the attacked sticks of the 1895 piles are very resinous in character. It is a fact well understood by operators treating yellow pine that knots and resinous pieces of timber are very refractory, that it is very difficult to force oil into them and that there is a wide variation in the amount of oil absorbed by the various pieces in the same cylinder load. From the examination of the 1895 piles and the analyses made, the writer believed that the sticks which show any considerable action by borers are in nearly every case those which have received less than the average amount of oil due to their refractory character. A number of the untreated piling were examined with a view to determining if in this case also the knots were the first point of attack. Knots seem to be very scarce, but a few instances were found where the knots were less attacked than the softer woods surrounding them. This would lead to the belief that the cause of the attack on knotty and resinous pieces of creosoted material is due primarily to the absence of creosote oil in a sufficiently large quantity and not to any particular fancy of the borers for this class of material. To secure the best results in marine work knotty and resinous piles should, as far as possible, be excluded by the specifications for the timber and the material given in full 24 lb. treatment of creosote oil and as much more as can be injected.

THE TURNER BRAZING MACHINE

The Turner brazing machine is designed for use in the removal of ice, snow and sleet from switches, frogs, interlocking connections, derails, and similar places. It consists of two powerful burners, each attached to a separate flexible oil tubing connected to a seamless steel tank of eight gallons capacity provided with an air pump and gage. The flames from the burners can be concentrated on a single point, or they can be used independently at any angle. The tank is placed beside the track and two

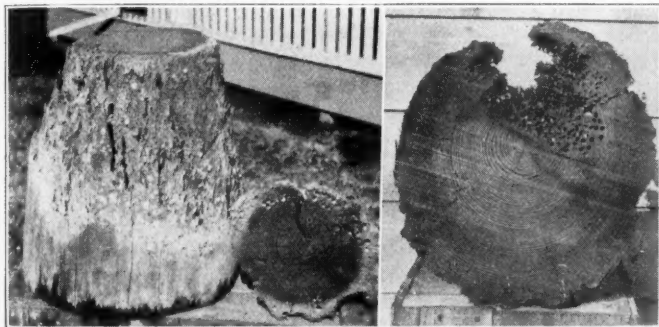


Fig. 5—Two Sections of Untreated Pile Completely Eaten Off

Fig. 6—An 1895 Pile Attacked by Teredo

how much oil was injected, but it must have been of necessity a great deal less than was injected into the pine. In spite of this fact it is found that the borers had attacked the cedar very slightly and not one of those examined would have needed to have been discarded because of this attack.

The oil used in the treatment of the 1895 piles was what was then known as heavy oil, not on account of the high specific gravity, but because at ordinary temperatures it contained a large per cent. of constituents in the solid state. It was imported English oil. No analyses were made by the consumer and there is no record of any having been made by the manufacturer. To determine its character, we must refer to the oil extracted from the mud sections of the piles. The oil was found to be a low boiling oil very rich in solids, especially naphthalene. It contained about 60 cent. of naphthalene and something over 12 per cent. of tar acids in the fractions distilling below 320 deg. centigrade.

After the Galveston causeway project was started it was decided that some reinforcements were needed for the trestle and some untreated pine piles were put in. Fig. 4 shows one of these untreated piles completely eaten into by limnoria with some teredo action also. Fig. 5 shows another of these untreated piles, the sections of which were taken at the water line and just below it. The vertical section shows the work of the limnoria, while the cross section shows that the teredo has also been at work. Over 75 per cent. of this pile had been eaten away.

In investigating piling that have been creosoted, it is noted



Melting Snow at a Switch

men can work at the same time. With the flexible connections they can step off the track to allow trains to pass and then proceed with the work with the minimum delay. Either kerosene or gasolene can be used for fuel and the tank has sufficient capacity to enable both burners to be operated at full blast for five hours. These machines are especially applicable for work around yards, crossings, interlocking plants and shop tracks. They can

also be used for straightening metallic parts on steel cars, expanding wheel tires, etc. Four of these machines were used in the new Chicago & North Western passenger terminal last winter, where they are reported to have given entire satisfaction. They are made by the Specialty Sales Company, 1305 Norwood street, Chicago.

LAYING RAIL ON THE LEHIGH VALLEY

It has been considered necessary to respace all ties to conform to standards whenever new rail is laid for so many years that in many places this practice has come to be considered a basic principle of track construction. However, the merit of this principle has been seriously questioned on several roads during the past two or three years. The experience of the Pittsburgh & Lake Erie in eliminating the spacing of ties when relaying rail was described in the *Railway Age Gazette* of November 15, 1912, page 936. The Lehigh Valley has adopted this practice more extensively than the Pittsburgh & Lake Erie, and it is now standard on the main lines of this road. The Chicago, Milwaukee & St. Paul also relaid over 100 miles of track in this way with new 100-lb., 90-lb., 75-lb. and 65-lb. rail on various lines during 1913. The Pennsylvania Lines relaid several miles of rail without spacing ties on the Indianapolis division in 1912. The Vandalia followed this same practice on the main line from Indianapolis to St. Louis for eight years, but discontinued it in 1911.

Another custom of long standing is that of discontinuing all work which can safely be postponed at the first sign of winter. This custom has been so universally adopted that the placing of forces on the "winter basis" has come to be synonymous with reducing them to the minimum. By eliminating the spacing of ties it is possible to lay rail during the winter. The Lehigh Valley has not only eliminated tie spacing, but after a careful trial with the laying of rail during the winter of 1911-12, all rail laid during the past year was placed during the winter months.

The first essential to the elimination of tie spacing is the thorough anchoring of the track to prevent the ties bunching. If the ties are properly spaced to start with and creeping is arrested, they will remain uniformly distributed and the only deviation from standards found when relaying rail will be at the joints. The second essential is a reinforced joint without a depending flange to render unimportant the location of the joint with reference to the ties. The Lehigh Valley has anchored its track thoroughly with an average of five anchors per rail and has adopted a heavy angle bar with a reinforced head. As a type of anti-creepers is generally used which fits the 90-lb., 100-lb. and 110-lb. rail, they are taken off the old rail before its removal and placed upon the new, after it is put in place, being applied to the new rail the day it is laid in all cases.

During the winter of 1912-13, over 300 miles of 100-lb. and 110-lb. rail were laid on this road between November 1 and April 26; the mileage renewed on the different divisions in each month being given in the following table:

Track miles rail laid	New Jersey & Lehigh division	Wyoming division	Buffalo division	Mahanoy & Hazleton division	Total
November, 1912.....	14.07	9.06	7.67	30.80
December, 1912.....	7.21	8.72	7.30	23.23
January, 1913.....	20.17	18.21	22.09	60.47
February, 1913.....	25.82	26.00	19.94	71.76
March, 1913.....	29.24	22.92	34.38	3.89	90.43
April, 1913.....	3.68	15.23	8.61	2.00	29.52
Total	100.19	100.14	99.99	5.89	306.21

To lay this rail one or two regular steel gangs were employed on each division in conjunction with the regular section gangs, the organization and character of the gang depending somewhat on the rate of delivery of the rail.

One of the most important advantages of this method was the employment of experienced track men throughout the year. With the arrival of winter the gangs which had been employed

in surfacing and similar work during the summer were diverted to rail laying. By combining section forces to lay rail, these gangs were also kept up nearly to their normal summer rating so that during the past summer it was only necessary to increase the forces about 15 per cent. above the winter basis. As the result, the labor shortage so evident on most other roads, was not felt to any extent on the Lehigh Valley in 1913. The value of experienced men was especially noticeable when laying rail on the heavy traffic lines last winter, when in many cases the maximum time that the track could be held was from 20 to 30 minutes, and it was necessary to place as much rail as possible in this short period. The section gangs with several experienced foremen in one gang were especially valuable here.

The primary consideration in any such experiment is, of course, its effect upon the cost of the work. The reduction in the immediate cost of relaying rail as the result of the elimination of tie spacing was estimated by the Pittsburgh & Lake Erie at \$125 per mile. With the later surfacing which would otherwise be made necessary by the disturbance of the track, this saving would probably reach \$200 a mile. While it is impossible to secure definite records of this saving, the experience of the Lehigh Valley leads to the belief that the above figures should be greatly increased.

Other advantages found are in the greater amount of work done per man in the winter as compared with the summer; in less difficulty in keeping the gangs full, and in more regular and prompt delivery of rail from the mills, especially when they are rushed as they were a year ago. Also, by this method other track work is less dependent upon rail laying and surfacing or tie renewals can be undertaken whenever necessary. With the general practice, surfacing now is either frequently postponed after it becomes necessary in order to await rail renewal, or if done, may be largely thrown away a year or two later when the rail is relaid. Another important consideration which should not be lost sight of is that by doing such work during the winter, the forces are engaged in productive labor. When such work is not undertaken a large portion of the time of the men regularly employed is spent in work which leaves nothing to show for it in the spring.

The general objection offered to this method is the fear of damage to the rail due to battering at the ends, but an inspection of track on the Lehigh Valley in which rail has been in service for over a year gave no indication of such damage. Careful measurements taken with a steel straight edge on a large number of joints at one place after this rail had been in service over one year, showed no difference in the wear of the rail over suspended, supported, or overhanging joints and no difference is discernible in the riding qualities of the track laid in this way as compared with the old method. Some of the rail laid in this way has now been in service two years in the main line under an average traffic of 25 freight trains of from 2,000 to 2,500 tons in addition to 10 heavy passenger trains per day over each track.

The Lehigh Valley has also made standard several other practices with reference to the handling or protection of rail not generally followed on other roads. Every supervisor is provided with a steam derrick for handling rail and about one-half the supervisors have a locomotive crane in addition. Frequently a steel gang follows closely behind a rail unloader, laying the new rail while the track is occupied by the unloader, thus reducing the total time the track is out of service. Two derricks are also frequently used to unload rail from one train as another means of reducing delays.

Acting on the principle that loose bolts are the cause of most of the deterioration of the rail at the joints, great care is taken to keep all bolts tight. Each track supervisor has one man who devotes his entire time to the inspection of bolts on his subdivision, checking up the different foremen. A general bolt inspector reporting to the engineer maintenance of way, is employed in the same work as a check on the division inspector. In making inspections these men report the number of loose

bolts per mile. If a mile or a section is found in bad condition, a second inspection is made after a short interval to see if the defective conditions have been remedied, and if not disciplinary measures are applied. These inspectors have now been employed for three years, and while at first they used to report several hundred loose bolts per mile, the number now found seldom exceeds 10. All bolts are also oiled in the spring and fall to protect them against salt brine drippings and other corrosive agents and to prevent nuts from corroding onto bolts so that the bolts may be easily tightened or removed from the old rail in serviceable condition when new rail is laid. This oil is applied by the trackwalker with a can or a swab.

DEFINING CAUSES OF DERAILMENT

In reporting derailments section foremen and supervisors on the same road differ widely when reporting the causes of accidents of the same nature, seriously complicating the correct analysis of these causes. To remove this lack of uniformity, officers of the Boston & Albany have devoted considerable time to the preparation of concise descriptions and definitions of the different causes of derailments in order to get a thoroughly comparative statement from the different track men so that the causes may be followed up and remedied as promptly as possible. As other roads are undoubtedly confronted with the same problem and some may perhaps have adopted similar measures, we will be glad to receive descriptions of them to the end that the number of derailments on all roads may be eventually reduced. We are indebted to F. B. Freeman, chief engineer of the Boston & Albany, for the following definitions.

Running Through a Switch.—This includes those accidents where the equipment is trailing through the switch, namely, moving from the frog towards the point of switch when the switch point is not open for that route but is lying against the stock rail, the result being that the flange of the wheel forces the switch point away from the stock rail in an effort to get through. As the switch point is held rigidly in place against the stock rail by the switch rods and switch stand mechanism, something has to give way. If the stand is of the "Twentieth Century" type the crank foot on the bottom of the stand which moves the throw rods generally breaks; otherwise the switch rods themselves are bent.

Switches Not Properly Thrown.—This includes instances where the switch point, which should rest firmly against the rail, is partially open, owing to the lever of the switch not being thrown all the way over and latched. As the engine moves over this point the wheel catches it and forces it open, passing between the point and the stock rail and straddling both points, or, in other words, splitting the switch. The result usually is the buckling of the rods or the breaking of the crank foot. Split switches may also result from poor adjustment of the switch stand or because of a badly worn tire climbing the switch point or forcing itself between the switch point and the stock rail. For this reason the designation "split switch" should not be used as it may be brought about in more than one way.

Switches Thrown Too Soon or Under Equipment.—This results where a switch is reversed before the equipment has cleared the switch point or before the derail point is passed where the derail is connected to and operated by the switch. This class of derailments is closely related to that known as running over a derail.

Switches Left Set Wrong.—The normal position of a switch is for a straight track or run and a switch is set wrong when it is left set for a diverging route. This class of derailments occurs mostly in yards and on ladder tracks and may result in running through a switch if a trailing movement is being made, or a collision if a direct movement is being made.

Equipment Pushed or Run Against a Bumper.—Such accidents result when switching cars on stub and industry tracks with too great force. They are also brought about by lack of proper

brakes on cars when left standing on a track, or due to defective couplers when making hitches, or to a misunderstanding of signals.

Equipment Pushed or Run Off the End of the Track.—This includes derailments resulting from cars going off the end of stub tracks where there is no bumper, as the result of accidents such as enumerated in the preceding paragraph.

Collision.—Under this heading are included those accidents resulting from cars coming together end on with greater force than intended, causing damage especially when a light car is between two heavily loaded cars.

Equipment Cornered.—When equipment standing either on the lead of a switch, or directly back of it and not beyond the clearance marker, is struck by other equipment which attempts to pass on the other tracks running in the direction of the converging tracks, i. e., from the frog to the switch, the cars are said to have been cornered.

Sideswipe.—This is a side collision. When cars standing on one track not clearing another track are struck by engines or cars on this second track these cars are said to have been sideswiped. This class of accident may also be caused by a scant clearance, but usually occurs where one track connects with another by a switch. It may also be caused by swinging doors on cars in transit or by overhanging loads.

Rough Switching.—Accidents resulting from rough switching are usually found in connection with yard work and are caused by the equipment coming together with more force than necessary, causing the car to jump; by sudden stops; by sudden application of the air or by excessive speed on yard tracks.

Running Through a Derail.—This results from equipment trailing through a switch point derail, left open.

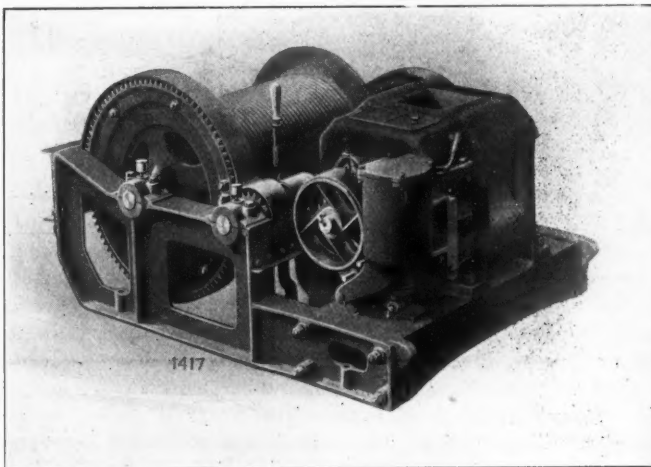
Running Off a Derail.—This happens where a point derail has performed its function, derailing equipment.

Running Over a Derail.—This occurs where a Hayes derail has performed its function or if connected with the switch, it may occur because of the derail being thrown under the equipment.

Defective Loading.—Such accidents are caused by unequal distribution of the load, causing the trucks to become rigid because of the increase in load on the rocker plate and to ride the high or guiding rail. It may also be caused by shifting loads.

A PORTABLE ELECTRIC DRAG FOR SHIFTING CARS

The drag shown in the accompanying photograph was originally designed for handling cars in paint shops where, for obvious reasons, it is unsafe for locomotives to enter. It is also adapted for use on construction work or as a stationary electric hoist for general contracting work. For the latter service it is equipped with a winch head not shown in the photograph. The frame consists of heavy steel sides securely connected by



A Portable Electric Drag

cast and structural steel cross pieces forming a rigid unit. The bottom of the frame is flush for skidding and is provided with bosses for holding down bolts. Lugs are also provided by which the machine may be moved from place to place.

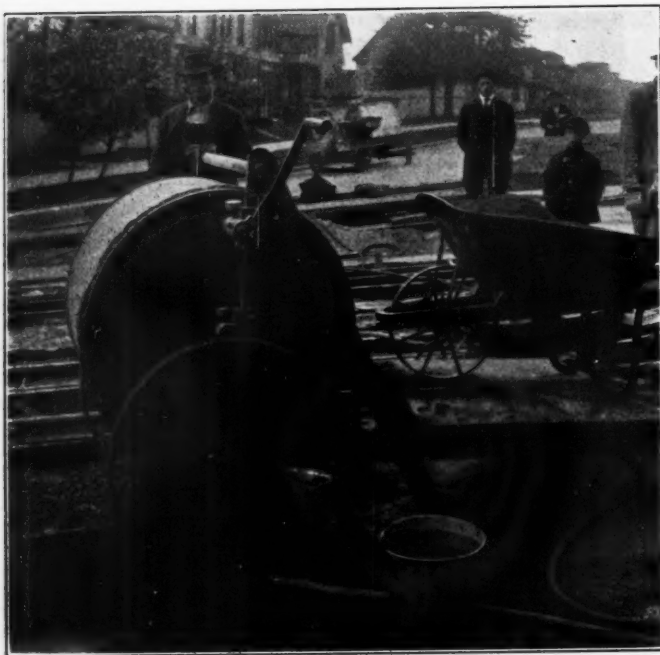
The winding drum is of cast iron with grooves to keep the hauling cable in place. The cable is of special plow steel rope $\frac{3}{4}$ in. in diameter, with 19 wires to the strand, six strands and a hemp core. The drum is free to rotate when necessary to unwind the rope when pulling on it. The clutch is motor controlled and is so arranged that the drum may be operated at a definite speed to unwind the rope. The motor is rated on the basis of a rise in temperature of 40 deg. centigrade after operation with full load for 30 minutes.

This drag is made in five standard sizes with a rope pull averaging from 2,300 lb. to 5,000 lb., and with a rope speed of 60 ft. to 150 ft. per minute. It can also be altered to meet special requirements as desired. This drag is built by the Shaw Electric Crane Company, and sold by Manning, Maxwell & Moore, Inc., New York.

THE SMITH HAND MIXER

In building or repairing small culverts, bridge piers and abutments, station platforms, etc., where the yardage is not sufficient to make it economical to operate a power mixer, hand mixing is usually resorted to. In order to provide a better grade of concrete for such work at a lower cost than is possible by hand mixing, the T. L. Smith Co., Milwaukee, Wis., has developed a $2\frac{1}{2}$ cu. ft. mechanical batch mixer operated by hand, which has been successfully used with resulting economy by a number of contractors and railways.

The drum is cylindrical with a diameter of 3 ft. and a length



The Smith Hand Mixer, Showing Method of Charging

of 2 ft. 8 in. The cylinder is made of No. 14 gage steel with cast heads. These heads are concaved to leave a space of only about 6 in. between the apexes, forming two wedge-like chambers in the cylinders which are connected by a 5-in. slot extending diametrically across the drum. The charge is placed in the mixer through an entry slot 2 ft. 4 in. long and 10 in. wide.

The cylinder is fixed on a $1\frac{1}{2}$ -in. cold rolled shaft revolving in interchangeable babbitted boxes. The power is applied by two cranks through pinions meshing with two internal gears cast into the cylinder heads one on each end of the drum. The large ratio between the pinion and the internal gear makes it easy for

two men, one at either end of the machine, to turn the mixer. Tests have shown that three turns of the drum are sufficient to produce a concrete superior to that mixed by hand.

The mixer is mounted on a truck having two 30-in. wheels and a charging platform of 3 ft. 7 in. wide supported on steel sills and legs. The height of the feeding platform is only 12 in., greatly reducing the work of charging the mixer. For some classes of work, a special truck with four flanged wheels can be used, allowing the machine to be operated on the track and concrete discharged between the rails.

The machine is charged and discharged through the slot mentioned above and during the revolution of the drum the mixture is prevented from falling out by an entry wall extending across one of the chambers in front of the opening. The discharge is effected by reversing the direction of rotation after the three complete turns have been made. The mixing action is secured in the forcing of the mass through the narrow slot between the



Placing Concrete Abutments Directly from a Smith Hand Mixer on Great Northern Snow Shed Work

two chambers and the impact in striking against the side of the cylinder as it falls through the slot.

The accompanying photographs show the application of this machine to two classes of work. In one case it is being used by Guthrie-McDougal & Company to place the footing for a reinforced concrete back wall of a snow shed on the Great Northern. In this work, as in many similar cases, the machine can be placed directly over the forms and the concrete dumped into place without wheeling or shoveling. The light weight of the machine, 1,000 lb., allows it to be moved readily between batches for this class of work.

The output of the machine depends on the charging rate, but when charged to capacity and cranked by two men of ordinary strength and diligence, the average output is 20 to 30 batches per hour or 30 to 35 yd. per day.

THE ACTUAL SERVICE OF THE TRACK SPIKE AND TIE PLATE

BY WALTER D. WOOD

Not long ago one of our large roads whose equipment and track are second to none, received a Pacific type locomotive which was far heavier and larger than any built previously. This locomotive was to be run on a division that required high speeds and had many sharp curves. When it was completed, the maintenance of way department refused to allow it to be operated over this division until the track could be strengthened throughout in spite of the fact that the division was at the time in first class order.

With a view to obtaining data regarding the strength of the rail fastenings now used, the writer designed apparatus to approximate the actual conditions. New dressed chestnut ties, A. S. C. E. section 100-lb. rail, and standard tie plates and spikes were used in all tests. Two spikes were driven on the inside and one on the outside of the rail.

A series of tests was first run to determine the holding power of the spikes alone. A section of rail was spiked to a section of tie in the regular manner, the tie was supported on end on the bed of a compression testing machine and a force was applied to the edge of the rail (corresponding to wheel flange pressure) by lowering the head of the compression machine by increments till the rail was forced from the tie, the highest reading of the machine being taken for the thrust required to displace the rail. A large number of tests were run with varying results. In a few the outside spikes sheared off. In the majority of cases, however, the inside spikes were pulled at a pressure of about 10,000 lbs. In other words, a side flange pressure alone of only 10,000 lbs. would overturn the rail.

In a very extensive series of tests made over a year ago on the West Jersey & Sea Shore, a considerable section of straight track was put upon specially built steel ties containing roller bearings. The rails had a possible lateral motion of some $\frac{5}{8}$ in., but no vertical motion. The track was brought to gage and plungers with steel balls in one end were adjusted so as to be in light contact with the outer edge of the rail; the steel balls in the end of the plungers, which were free to move laterally with the rail, rested in turn against calibrated pieces of boiler plate, an impression of a certain depth meaning so many thousand pounds side thrust. Heavy and light locomotives, with and without tenders, and double headed, were run over the track at high and low speeds and the plates were measured after each run. Although the main object of the test was to determine the effect of counterbalancing on the swaying and nosing of locomotives, few results of any

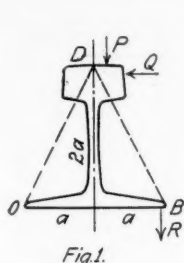


Fig. 1.

Forces Tending to Overturn a Rail—Device for Measuring Overturning Effect

value were obtained, as locomotives improperly balanced often rode better and showed less side thrust than those which were perfectly balanced. Also due to there being several pairs of drivers, with pony trucks and trailers, it could not be proven whether the impression was caused by any one set or was a cumulative effect caused by all. One startling effect, however, that seemed to have been entirely overlooked

was that some impressions were obtained which showed a side thrust of about 20,000 lbs. This, as shown by the machine tests, was twice what was necessary to pull the spikes. The question now properly arises: Why doesn't the rail turn? The answer is simply that the weight of the locomotive itself and not the spikes prevents it. The tie plate also plays an important part by preventing the lateral motion of the rail. The above conclusions will now be proven analytically and experimentally. A rail of equal base and altitude is taken for simplicity, but the theorem can be applied to any section. Referring to Fig. 1, we have a section of rail O B D acted upon by the three forces P, Q & R representing, respectively, the weight of driver, the side thrust and the resistance of the inside spikes. Taking a summation of moments about O (as O is the point about which the rail will turn when overturned) we have $Q \times 2a = P \times a + R \times 2a$, a and 2a being the length of the respective lever arms from the point of application of the forces to their center of moments O. Simplifying the above we have

$$Q = \frac{P}{2} + R$$

or in other words, for the rail to be in equilibrium the side thrust Q must be equal to one-half the load on the drivers plus the resistance of the spikes R. In actual conditions when this limit is reached the rail will naturally overturn. It now only remains to substitute the values for the given wheel loads to determine the required side thrust to turn the rail. The spike resistance R of course is constant at 10,000 lbs., which leaves Q the only unknown in the above equation:

$$Q = \frac{P}{2} + 10,000$$

For various wheel loads, the side thrusts are as follows:

Wheel load.	Side thrust.	Per cent.
15,000 lbs.	17,500 lbs.	116.5
20,000 lbs.	20,000 lbs.	100.0
25,000 lbs.	22,500 lbs.	90.0
30,000 lbs.	25,000 lbs.	83.5
35,000 lbs.	27,500 lbs.	78.5
40,000 lbs.	30,000 lbs.	75.0

The above results show that as the weight of the engine increases the per cent. of the weight on drivers necessary to overturn the rail decreases. This is what might naturally be expected.

Now bearing in mind the fact that but 10,000 lbs. is necessary to pull the spikes in new ties and that a side thrust of some 20,000 lbs. was actually obtained on the West Jersey and Sea Shore with a 35,000-lb. wheel load, it follows from comparison that the limit of safety was very closely approached, for referring to the above table it is shown that with a wheel load of 35,000 lbs. we need a side thrust of only 27,500 lbs. to overturn the rail. As 20,000 lbs. was obtained in this instance, it leaves 7,500 lbs. which was held by the spikes alone or a safety margin of only 2,500 lbs. Now if old ties were used instead of new ones this safety limit would be reduced almost to zero. To sum up in a few words—theoretically the limit of safety was passed when a side thrust of 20,000 lbs. was obtained with a weight on drivers of 35,000 lbs.

At once the question arises as to the difference between theory and practice. To check the results of the foregoing a machine was devised as shown in Fig. 2, for obtaining these results in the laboratory. A section of rail was spiked to a new chestnut tie with tie plate as before. The under side of the tie was backed by a steel plate over which worked a roller bearing, which in turn was backed by a rigid non-movable plate. A section of locomotive tire was now cut and placed against the rail as shown in the figure. A 40,000-lbs. capacity spring was then placed on the tire and a screw jack back of that. The spring being previously calibrated, any load of from 20,000 to 40,000 lbs. could be placed upon it. In conducting the test, the side thrust Q was placed upon the rail by applying a force Q' to the end of the tie

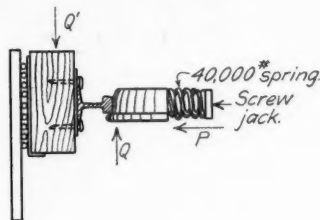


Fig. 2.

as shown, the tire being supported by a block Q so it could not move downward. A load of 20,000 lbs., representing the weight on one driver, was placed on the rail and tire by means of the screw jacks and then the tie and rail which are free to move vertically were gradually forced downward against the tire until the spikes pulled out, the highest reading of the machine being taken for Q. It was also necessary to slack off on the screw jack when the rail started to turn, as it is evident that as the rail turned the line D O (see Fig. 1) acting as a radius increased the height of the rail from 2a to $\sqrt{a^2 + 2a^2}$ thus forcing back the tire and placing a greater load upon the spring unless the jack was released correspondingly.

In the same manner loads of 25,000, 30,000 and 35,000 lbs. were placed upon the driver and a load applied at Q' till the rail turned. The following results averaged from a large number of tests were obtained:

Wheel load.	Side thrust.	Theoretical side thrust.
20,000 lbs.	19,769 lbs.	20,000 lbs.
25,000 lbs.	22,491 lbs.	22,500 lbs.
30,000 lbs.	24,892 lbs.	25,000 lbs.
35,000 lbs.	(See note)	27,500 lbs.

NOTE.—True results could not be obtained for this wheel load as the tie plate was forced into the tie, causing its failure by splitting and shearing.

The above results, which are the average of a large number of tests, show how closely the actual results approach the theoretical, being in all cases but slightly less. We may therefore assume that within fair limits our foregoing conclusions are correct.

The following additional points were brought out in the above tests. Due to the sharp rib on the under side of the tie plate sinking into the tie the lateral motion of the rail is practically nil, being less than $\frac{1}{4}$ in. in most cases, before the spikes pulled. With a wheel load of 35,000 lbs. the turning of the outside edge of the rail forced the tie plate deeply into the tie, bending it and causing it to cut like a knife, crushing and splitting the tie down the center from the center of the rib to the lower end of tie. This also occurred in a few cases with a 30,000-lb. wheel load, but not to such an extent as to prevent obtaining reliable readings.

There is one thing more that enters in these deductions. We must take into consideration that we do not have a wheel over every tie. If, for instance, we assume that in actual service the ties are spaced about 21 in. apart and a locomotive has 6-ft. drivers, about $3\frac{1}{2}$ ties would support the rail between drivers (allowing about 3 in. clearance between tires). Therefore, each wheel would be supported by three separate ties instead of one and the crushing effect would not be as severe as in the test.

Again, the fact that we have $3\frac{1}{2}$ ties with 7 spikes, instead of one with two spikes to resist the side thrust, might lead to the belief that we now have a spike resistance to overturning of 35,000 lbs. instead of 10,000 lbs., which is quite true, but whereas, the results obtained in the laboratory were produced by a slowly applied steady load, the results which we get in service arise from quickly applied loads or shocks. It is generally recognized practice to allow a factor of safety of 10 where iron and steel is to be subjected to sudden shocks or live load. Substituting the value of 35,000 instead of 10,000 in our formula where we had a 35,000-lb. wheel load we have:

$$Q = \frac{P}{2} + R \text{ or } Q = \frac{17,500}{2} + 35,000 = 52,500 \text{ lbs.}$$

If we subtract the 27,500 lbs., necessary to overturn the rail with this wheel load we find that the present method of spiking allows for a factor of safety of 1.91, which is far from 10 and not even the factor 3, which is allowed for dead load.

It must be evident therefore that the factor of safety of the present 100-lb. rail with standard spiking and tie plates is exceedingly low.

FLOATING GRAIN ELEVATORS IN GERMAN SEAPORT.—At the port of Hamburg there are 24 floating grain elevators for transferring grain from ships to warehouses.

THE JONES AUTOMATIC WATER TANK SPOUT LOCK

A device for locking the spout of a water tank upright in position so that the wind, the jar of passing trains or the breaking of the weight chain will not allow it to hang dangerously over the track, is now being used experimentally on a tank of the Chesapeake & Ohio at Marion, Ind. This lock was con-



View of Spout Lock with Spout Ring

structed of $\frac{3}{16}$ -in. strap iron, although No. 8 or even lighter gage iron can be used and consists essentially of a steel plate bent to form three sides of a rectangle with a latch engaging a hook attached to the spout of the tank, holding it in position until released by the spout chain. The latch "C" is movable between fixed buffers "E" and "D." This latch or locking mechanism is thrown upward by the hook "K" attached to the spout as the spout is raised and drops down over this hook, engaging it and holding it in position.

To bring the spout down the fireman first pulls down on that end of the chain attached to the locking device and then after this is released, pulls down the spout.

A patent has been applied for by R. H. Jones, of Peru, Ind.



The Spout Locked in Position

General News Department

The Great Northern roundhouse at Rutland, N. D., was destroyed by fire on February 8.

The Chicago, Rock Island & Pacific on February 12 opened its new \$40,000 passenger station at Fairbury, Neb.

The Alaska railroad bill passed the Lower House of Congress on Wednesday by a vote of 230 to 87 and now goes to conference.

The incoming baggage shed of the Illinois Central at Chicago was damaged by fire on February 11 to an amount estimated at \$50,000, including contents.

The Philadelphia & Reading has lately organized general and division safety committees. The chairman of the general committee is N. W. Jones, inspector of transportation, Reading, Pa.

The Baltimore & Ohio has recently resumed traffic over the bridges at Lawrenceburg, Ind., and Hamilton, O., which were put out of commission by the floods of last spring. These are the last of the seven important bridges which this company had to rebuild or extensively repair in consequence of the ravages of last year's flood.

Maximo Castillo, the Mexican bandit who destroyed two railway trains in a tunnel, killing 50 persons, has been captured in this country and is now in the custody of United States troops at Hachita, N. M. General Villa, Mexican insurgent commander, has made formal demand on the governor of Texas and also on the government at Washington that Castillo be returned to Mexico for punishment.

The Frisco Women's Safety League has been organized by members of families of St. Louis & San Francisco employees, with a membership of 1,000, subdivided into 10 division chapters of 90 each and four terminal chapters of 25 each, representing the 10 operating divisions and four terminals of the road. Division league meetings will be held occasionally in connection with the meetings of the division safety committees.

The Metropolitan Street Railway of Kansas City has ordered that conductors and motormen wear on their uniforms black buttons, instead of the brass heretofore in vogue; this for the benefit of the employees who go off duty at times when it is not convenient to change their clothing for street wear. Hereafter, employees of these lines who have served ten years will wear, instead of a star, a button of gold, on which is inscribed the number of years served. The button is attached to the lapel of the coat and can be easily removed.

The Pittsburgh Railways Company, operating street railways in Pittsburgh, Pa., has bought insurance policies approximating \$1,250,000 in value on the lives of employees who have been with the company more than one year. Individual policies will be given to the men, from the president down to the office boys. Upon the death from any cause whatever of any employee who has served two years, his family will be entitled to one year's salary, to be paid monthly for one year. The family of one who dies after one year in the service will be entitled to half of his salary for a year. The company pays all the insurance charges.

The new general safety committee of the Baltimore & Ohio has as one of its members a physician, Dr. Parlett, who devotes his entire time to matters concerned with the hygiene and physical welfare of employees. Dr. Parlett is now inspecting the restaurants along the road and also the rest houses occupied by trainmen at division terminals. He is going to look into the ventilation of passenger trains. The regular physical examination of men employed in the dining cars on the Baltimore & Ohio will hereafter be extended to the employees of the restaurants and the rest houses also. All these employees must have certificates of health to show that they are free from contagious or communicable diseases. Women employees are examined by women physicians in the employ of the company.

In conducting its investigation of the records of the Louisville & Nashville, at Louisville, recently, the agents of the Interstate Commerce Commission were ordered out of the office by Vice-President W. L. Mapother, who declared that the commission was going beyond its powers; and on the presentation in the Senate at Washington of a report by Commissioner Meyer, giving the facts of this matter, a resolution was introduced by Senator Lea, of Tennessee, providing for the appointment of a special committee of the Senate to back up the commission. The resolution was, however, subjected to considerable discussion and at last accounts it had not been passed, the proceedings of the Senate having been interrupted by the death of Senator Bacon and other circumstances. The files to which the commission was denied access related to free passes and to matters connected with contributions of money for political purposes.

The suit against Charles S. Mellen, former president of the New York, New Haven & Hartford, charging manslaughter in connection with the derailment of a passenger train at Westport, Conn., October 3, 1912, was called in the Superior Court at Bridgeport, Conn., on Tuesday of this week, but Mr. Mellen's attorneys entered a claim that the proceedings are unconstitutional and took exception to the jurisdiction of the court. They alleged that a warrant for the arrest of a person upon manslaughter charges can be issued only upon probable cause, supported by the sworn oaths of witnesses who have a personal knowledge of the matter; that no affidavits have been filed to substantiate the present charges, and that the state's attorney has no personal knowledge of the alleged facts as set forth in the warrant. The plea will be argued before Judge Tuttle probably this week. The indictments of other officers of the road in connection with this derailment have been quashed. The other defendants who are relieved of the charge of criminal responsibility are E. H. McHenry, H. J. Horn, L. J. Carmalt, B. R. Pollock and C. N. Woodward. The indictments were handed down in April last. Homer S. Cummings, personal counsel to Mr. Mellen, is said to have become incensed at the delay and made an insistent demand on State's Attorney Judson to put his client on trial. This is thought to be the reason why Mr. Judson moved to quash the other indictments, so that he could devote his energy to the case of Mr. Mellen.

Legislative News

[From the Philadelphia Public Ledger.]

The New Jersey Legislature continued to brandish clubs over the head of the Pennsylvania Railroad tonight. In the House two resolutions were offered, one making a vicious stab at the railroad's pension and relief department, another calling for an investigation to determine why the Camden & Sea Shore Railroad should not build a suitable terminal at Atlantic City.

These resolutions followed on the heels of a public hearing, at which it was seriously proposed to divest the railroad of its control of the Delaware & Raritan Canal. All this goes to show that the legislature is still in a temper because of the railroad company's action in cutting off the passes of 137 state employees.

The President and the Railroads

[From the Providence Journal.]

President Wilson says that "the prosperity of the railroads and the prosperity of the people are inseparably connected," and that the railroads should be supplied with "the money they need for their proper development to meet the rapidly growing requirements of the country." The country is damaged because railroad development is checked, and the 5 per cent. advance asked by no means covers the rising cost of labor and commodities and the extraordinary increases in taxation.

The Interstate Commerce Commission's program as laid out is very suggestive of delay. There is no need of reviewing ancient history in minute detail; the commission has regulated

rates for many years without the statistics required by the long list of questions recently issued. There will be no business revival until the railroads are enabled to place large orders. Expenses are becoming more and more burdensome and net earnings are disappearing. A prompt decision on rates is necessary, and the country is not inclined to favor months of haggling by lawyers over petty details. More plain talk by the President will hasten the business improvement for which all are waiting.

Report on Collision at Georgia, Vt.

The Interstate Commerce Commission has issued a report, dated January 12, giving the conclusions of Inspector H. W. Belnap concerning the causes of a butting collision on the Central Vermont, near Georgia, November 16, in which one fireman and one trespasser were killed. This was a collision of freight trains caused by an engineman making a mistake in reading a telegraphic order. This order made a meeting point at Georgia, but the engineman in some manner took the word to be "Oakland." The inspector finds bad practice in many details. A brakeman signed the conductor's name in receiving the order, and this practice appears to have been common. The operator did not take care to see that he was dealing with the conductor. The order might have been sent to the meeting point and thus probably the collision would have been prevented; but the rule to send orders to meeting points, when practicable, had been long neglected and the superintendent had knowledge of this. Last November a special circular was issued requiring adherence to the rules in relation to signing and reading orders, etc., but this special notice seems not to have been carefully carried out. The testimony concerning this collision is conflicting in many details, but the inspector concludes that there was much loose practice, the brakeman acting for the conductor and for the engineman whenever that course was most convenient. The engineman at fault had been in the service eight years and had been suspended several times; while the conductor had been in the service since 1880 and had a clear record. The general conclusion in the report is that the Central Vermont should take immediate steps looking to the proper observance and enforcement of its operating rules.

New Terminal Plans for Chicago

An amended plan for a new union passenger station and for freight terminals for the Pennsylvania in Chicago was submitted to the city council committee on railway terminals on February 14 by the Pennsylvania Lines, the Chicago, Burlington & Quincy and the Chicago, Milwaukee & St. Paul, and was referred to a sub-committee for consideration. The location of the passenger station is the same as in the previous plans, on which the roads and the city failed to agree last year, the headhouse between Jackson and Adams streets and Canal and Clinton streets, and the trainshed between Canal street and the river. The freight terminal is to be between Canal street and the river south of Polk street, with approaches extending as far south as Sixteenth street, instead of between Jefferson and Desplaines streets, as proposed last year. The railways also offer a number of concessions demanded by the city, including street improvements, bridges and viaducts, to cost approximately \$6,500,000, and agree to co-operate in straightening the Chicago river.

Mismanagement in Canadian Government Railway Construction

A report of an investigating commission, presented in the Canadian parliament last week, declares that in the construction of the National Transcontinental Railway the enormous sum of \$40,000,000 has been misspent—wasted. The investigating commission, consisting of F. P. Gutelius, now general manager of government railways, and J. Lynch-Staunton, was appointed two years ago by the Borden Government to investigate charges of extravagance, corruption and mismanagement in the construction of the National Transcontinental, which is the eastern section of the Grand Trunk Pacific. The report created a sensation, no such wholesale charges of great waste ever having been made in Canada before.

The Dominion Government undertook to build the Transcontinental from Winnipeg to Moncton, N. B. The report of the commission says that the original estimate of the cost of construction, which was placed by the then Minister of Finance at

\$61,415,000, had in September, 1911, reached \$109,000,000, and that estimates then made showed that the final cost would be \$161,300,000; that if the road is completed this year at this cost it will, in 1922, when, according to the terms of the contract, the Grand Trunk Pacific begins to pay 3 per cent. rental to the Government, have cost the people of Canada in principal and interest \$234,651,521. It is charged that general extravagance and the payment of political favors through contracts of various kinds went to make up the total loss. Until the appointment of Major R. W. Leonard, in the autumn of 1911, no member of the Transcontinental Railway Commission had any experience or knowledge of railway building or operation. The standard of the railway was decided on without any knowledge as to whether it was suitable for the country, and on assumptions as to business which were not warranted.

The rules adopted by the commission resulted in only five contractors tendering for only 806 miles of railway. Eleven firms secured all the work and sub-let it to upwards of one hundred sub-contractors who, if ordinary government practice had been followed, would in all probability have competed in the bidding. As an indication of the handsome profits derived by these eleven firms, says the report, they were paid \$8,800,000 in profits for that part of the work which they sub-let.

The following details of the charges made in the report are condensed from the *Montreal Herald*:

M. P. and J. T. Davis, of Ottawa, secured three-quarters of a million dollars "rake-off" on two contracts. They agreed to finish contract No. 16 by December 31, 1910, and No. 17 by March, 1911. Very high prices were agreed to be paid on account of the remoteness of the work to the north of Lake Nipigon. In September, 1909, not a stroke of work had been done on either contract, and at that time the work had become easy of access.

Mr. Hays of the Grand Trunk, drew Sir Wilfrid Laurier's attention to the fact that the time had nearly expired for doing this work; that none of it had been done; and that a high price had been agreed upon because of its remoteness from civilization. Therefore, because the work was now easily accessible the Government should cancel the contracts and advertise them again under new conditions.

The then Prime Minister took no action, and the commission refused to cancel the contract; but it was assigned to others and Messrs. Davis received \$740,000 for doing nothing. Contractors were overpaid \$3,300,000 on improper classification, and a new sub-classification called "assembled rock" was improperly introduced. Ploughable clay in new Ontario which should have been classified as common excavation, was classified as loose rock, resulting in a loss of \$750,000. If momentum grades had been adopted, \$6,200,000 would have been saved. Sharper curves would have saved \$2,400,000, and wooden trestles instead of "train fill" and steel structures, would have saved \$2,947,227. If the commission had arranged to do the train filling after the road was opened, \$3,250,000 more would have been saved.

Sixteen engine houses cost \$800,000 more than they should, because the commission neglected to name a price for their construction. This was a direct violation of the statute. There were similar wastes in building stations. Had the piers of the Cap Rouge viaduct, near Quebec, been built with ordinary open caissons, as they should, the same result would have been had for \$250,000 less. The Chaudiere cut, east of the Quebec bridge, cost \$239,000 too much. Pusher grades at the Little Salmon river viaduct in New Brunswick would have saved \$1,750,000 in ten miles. . . . The government engineer agreed that a pusher grade would not harm the railway, but in spite of the protests of everybody, this money was thrown away.

The original plan was to build along the whole line two sidings at seven mile intervals. After having spent \$374,500 on the second sidings, the commission realized that this was an unwarranted expenditure, and built only one. The sum of \$340,500 was wasted in not using lighter rails on 367 miles of sidings and yard tracks. Unnecessary double tracking cost \$679,692. The sum of \$166,900 was uselessly spent in draining borrow pits. Contractors and land owners were overpaid in numerous instances.

The use of cast iron pipe instead of concrete as is the usual practice to carry water from ditches under highways and farm crossings would have saved \$12,072. Two streams in Quebec were crossed with concrete arches instead of steel, and \$234,000 was wasted.

A Quebec "election job," which involved the pretended purchase of a lease, cost \$7,950. The Transcontinental shops at Winnipeg, which are to cost \$4,500,000 are not authorized by law and are twice as large as are required by the Eastern division. Large sums of money could have been saved in negotiations for the entrance to Winnipeg.

In the opinion of the commissioners large sums of money in interest have been lost by the premature construction of the New Brunswick section. It should not have been constructed at all. It cost \$35,000,000 and the country is paying \$1,200,000 of interest annually upon that sum. The road parallels the Intercolonial and is earning nothing. Trees are growing on the right of way, the ties are rotting, and the rails are rusting away. The commissioners are of opinion that it was built for the purpose of placating the supporters of the government east of Quebec.

Report of Derailment Near Oyama, N. C.

The Interstate Commerce Commission has issued a report, by the chief inspector of safety appliances, on the derailment of a Southern Railway freight train near Oyama, N. C., March 31, 1913, which resulted in the death of three employees and the injury of a trespasser. This derailment was caused by a broken rail. The track at this point was laid with 80-lb. rails, single spiked to oak ties with 8 in. of rock ballast; and the track was maintained in good condition. The rail in question was an 80-lb. section, 33 ft. long, rolled by the Tennessee Coal & Iron Company, in November, 1904, and laid in the track in January, 1905. The rail was found broken in 10 pieces. The report consists principally of discussion and conclusions by James E. Howard, engineer physicist of the Bureau of Standards, who examined the rail. He says that there was a transverse fissure 1 in. in diameter between two fragments of the rail. This is believed to be the location of the initial fracture. The report indicates that no further transverse fissures were found, although an incipient fissure was disclosed in one of the test specimens. The report significantly states that although it was necessary to replace 18 rails, only this one was broken and the other 17 were twisted and bent. The indications were that the rail was broken under a preceding train, traveling in the opposite direction. In the examination of the broken rail, the splitting of the head and the starting of longitudinal cracks in a number of places indicated a seamy state of the metal. Tensile tests also showed that the metal was low in ductility.

The Missouri, Kansas & Texas in the State of Texas

The agreement by which the Attorney General of Texas withdraws his suit against the Missouri, Kansas & Texas, under the anti-trust law of that state, noticed last week, page 341, has been approved by the Fifty-Third District Court at Austin, Judge George Calhoun.

The railroad company may now go ahead and rehabilitate its property and consolidate its Texas lines as contemplated by the Legislature. It is expected that it will spend \$6,000,000 to accomplish this. It will have to respond to other exactions of the Attorney General, but all matters in controversy are settled and the Missouri, Kansas & Texas Railway Company of Texas is now free, so far as the laws of Texas are concerned.

The Attorney General undertook to dissolve the consolidation of eight Texas lines which were consolidated by law, to enjoin future consolidation and to collect \$15,000,000 in penalties; but in the final result consolidation is authorized, and no penalties are collected. When the Legislature first passed the "Katy consolidation bill" the attorney general advised the governor that it was unconstitutional and it was vetoed. Then the legislature passed the bill over the governor's veto and it became a law. Almost immediately the attorney general brought the injunction suit.

Under the stipulations of the settlement, no officer of the Kansas corporation may ever exercise authority on the Texas properties, but officers of the Texas company may exercise it on the M. K. & T. outside of Texas without violating the agreement. In that way W. A. Webb, general manager of all M. K. & T. lines, with office at Dallas, may continue in that capacity. The power to vote the stock of the Texas company is taken away from the Kansas company and vested forever in the persons who shall compose the board of directors of the Texas company, which board of directors are to be agreed upon by the attorney

general and the company. This agreed board of directors is given the exclusive power, both by the agreement and the judgment of the court, to vote the stock of the company, select its own successors and manage the affairs of the company. The agreement and the decree require the Kansas company to divest itself of all right, title, interest and stated stock in the Missouri, Kansas & Texas Railway Company of Texas and convey the same to H. E. Hilderbrand, of San Antonio, who in turn is required to convey the interest thus acquired by him to the Central Trust Company of New York for the use and benefit of the stock and bondholders of the Missouri, Kansas & Texas Railway Company of Kansas, it being shown in the agreement that all this stock was pledged to the Central Trust Company of New York as trustee for such use since 1891. The purpose of this particular requirement is to divest the Kansas company of all corporate interest or right in the affairs of the Texas company.

All traffic operating agreements between the Missouri, Kansas & Texas Railway Company of Texas and the Missouri, Kansas & Texas Railway Company of Kansas and the Wichita Falls & Northwestern Railway Company of Oklahoma are required to be submitted to the Railroad Commission of Texas before becoming effective.

The agreement provides for the exercise by the attorney general of visitatorial powers over the records of the Kansas company which may be kept in Texas, and provides further that any information which cannot be obtained within the State will be furnished by the Kansas company.

A part of the agreement which has to do with proposed new lines is not made public, for the reason that it would disclose where the extensions are to be built and possibly embarrass the railroad company in purchasing right of way.

By the terms of the agreement \$6,000,000 must be expended in six years for betterments and extensions; this exclusive of cost of repairing damage by the recent floods.

Three auditors will audit the books of the two corporations to determine the exact status of each in their relation to one another; and then the attorney general can adjust the old debt of \$11,500,000, said to be due the Kansas corporation by the Texas company. An auditor is to be selected by each side and one by the court. A complete divorcement and reorganization of the Texas company is exacted, to be accomplished not later than April 24.

Smithville and Walnut Springs are to get back their shops. It is expected that the M. K. & T. will provide its own passenger stations and freight yards in Austin and San Antonio and freight houses in the latter city. Among extensions thought to be contemplated are a direct line south of Austin to connect with the Houston-Smithville-San Antonio line, a line from McKinney to Denton and a connection with Waco or some other point on the main line with its line in East Texas. Hereafter all Texas repair work must be done in Texas.

Divisional Meeting, Association of Railroad Telegraph Superintendents

The regular meeting of the Western Division of the Association of Railway Telegraph Superintendents will be held at the LaSalle Hotel, Chicago, on March 18, the following subjects being scheduled for discussion:

Use of the telephone for despatching trains and handling messages. General discussion. (While this subject has been freely discussed at previous meetings, it is desired to have members report progress, explain new developments, and give data showing money savings and gains effected by use of the telephone, based on actual experiences during the past few years.)

Use of motor cars by stationed or section linemen, inspectors and gangs.

Automatic telephone for railroad intercommunicative service between yards, shops, offices, etc. Report of experience by members who now use the automatic telephone.

Wire crossings over railroad tracks and property. What progress has been made in adoption of the association specifications for both high and low tension wires. General discussion.

E. C. Keenan, Chicago, general superintendent telegraph, New York Central Lines west, is chairman of the Western Division, and is making arrangements for a very interesting meeting.

Canadian Society of Civil Engineers

At the regular monthly meeting of the Canadian Society of Civil Engineers on February 5, a paper was read by P. B. Motley, bridge engineer of the Canadian Pacific, describing the erection of the St. Lawrence river bridge near Montreal. This work was described in the *Railway Age Gazette* of October 11, 1912, and May 9, 1913.

Railway Club of Pittsburgh

At the regular meeting of the Railway Club of Pittsburgh, to be held at the Monongahela House, Pittsburgh, on February 27, a paper will be presented by S. C. Bannister, manager, National Tube Company, Kewanee, Ill., entitled: Manufacture, Characteristics and Advantages of Malleable Iron Pipe Fittings. There will also be a meeting of the club's committee on revision of the M. C. B. rules of interchange on February 26.

The American Railway Tool Foremen's Association

The American Railway Tool Foremen's Association will hold its sixth annual convention at the Hotel Sherman, Chicago, July 20-22, 1914. Among the subjects to be considered at the meetings are: The Standardization of Reamers for Locomotive Repair Shops; Machine Tool Repairs; Tool Room Grinding; Special Tools for Drilling; Reaming and Milling; Distribution of Tools for Shop Use; Dies for Cold Work, and Press and Special Punching.

American Society for Testing Materials

The executive committee of the American Society for Testing Materials has announced that the seventeenth annual meeting will be held at Atlantic City, N. J., June 30 to July 4, 1914, with headquarters at the Hotel Traymore. As it is desired that papers and committee reports be printed and circulated in advance of the meeting, all manuscripts should be in the hands of the secretary-treasurer by April 15.

MEETINGS AND CONVENTIONS

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Next convention, May 5-8, Hotel Pontchartrain, Detroit, Mich.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass. Convention, May 19, 1914, St. Louis.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Next convention, April 21, Houston, Tex.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Thursday and Friday in May.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—E. B. Burritt, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—H. G. McConaughy, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Next convention, October 20-22, 1914, Los Angeles, Cal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago. Next convention, March 17-20, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Karpen Building, Chicago. June 15-17, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga. Next convention, July 20-22, Hotel Sherman, Chicago.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa. Next annual meeting, June 30 to July 4, Hotel Traymore, Atlantic City, N. J.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 West 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wenlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York. June 16-19, St. Paul-Minneapolis, Minn.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 19-21, Chicago.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, Highland Park, Ill. Annual meeting, June 24, Minneapolis, Minn.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—C. W. Egan, B. & O., Baltimore, Md. Next convention, May, 1914, St. Paul, Minn.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago. Next convention, May 20-23, New Orleans, La.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—L. D. Mitchell, Detroit Graphite Co., Detroit, Mich. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and August, Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after second Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. H. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va. Next convention, May 13, Hotel Galvez, Galveston, Tex.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual convention, May 18-22, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 14-17, Hotel Sherman, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Next convention, third Tuesday in August.

MAINTENANCE OF WAY & MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—T. I. Goodwin, C. R. I. & P., Eldon, Mo. Next convention, November 17-19, 1914, Detroit, Mich.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Next annual meeting, May 26-29, Hotel Waldron, Philadelphia.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Karpen building, Chicago. June 10-12, Atlantic City, N. J.

MASTER CAR & LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Next convention, September 8-11, Nashville, Tenn.

NATIONAL RAILWAY APPLIANCE ASSOC.—Bruce V. Crandall, 537 So. Dearboth St., Chicago. Meetings with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3rd Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C. M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria; 2d Thursday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 30 Church St., New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY FIRE PROTECTION ASSOCIATION.—C. B. Edwards, Mobile & Ohio, Mobile, Ala.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Next convention, May 18-20, Hotel Raleigh, Washington, D. C.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. & TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Sups.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Next convention, September 8-10, 1914, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SALT LAKE TRANSPORTATION CLUB.—R. E. Rowland, 519 Boston building, Salt Lake City, Utah; 1st Saturday of each month, Salt Lake City.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meeting with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meetings with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7122 Stewart Ave., Chicago. Next convention, June 16, Jacksonville, Fla.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Next meeting, August, Chicago.

UTAH SOCIETY OF ENGINEERS.—Fred D. Ulmer, Oregon Short Line, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Karpen building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News

The Western Classification Committee has announced hearings at its office in Chicago on February 19, 20, 24, 25 and 27.

The State Railroad Commission of Georgia has refused to approve the tariffs presented by the roads of that state, for intrastate traffic, calling for the payment of two fares by a passenger who occupies the whole of a stateroom in a sleeping car. This rule, adopted generally by the roads east of Chicago, to go into effect March 1, is still under debate in western territory for the reason, it is said, that the Denver & Rio Grande is opposed to its adoption.

Fairfax Harrison, president of the Southern Railway, has addressed a letter to the heads of the nine state agricultural colleges in the South suggesting that the agricultural scholarships which the late President Finley inaugurated in the early part of 1912 be designated: "Southern Railway Scholarship: William Wilson Finley Foundation." These scholarships offer complete courses in agriculture to deserving farmer boys who live in counties traversed by the Southern Railway and affiliated lines, and who could not otherwise secure such an education.

The Southern Railway has applied to the Interstate Commerce Commission for permission to continue its stock ownership in the Old Dominion Steamship Company and the Chesapeake Steamship Company. The Old Dominion Line runs steamers between New York City, Fortress Monroe, Newport News, Norfolk, Richmond and other points, and in addition owns a majority of the stock of the Virginia Navigation Company, which operates on the James River and Chesapeake Bay. The petition stated furthermore that the Chesapeake & Ohio, Atlantic Coast Line, Norfolk & Western and Seaboard Air Line railroads are interested in the ownership of the Old Dominion Line. The Southern and the Norfolk & Western each own 2,100 shares, and the other roads own little over 1,000 shares each, out of a total of 15,000 shares. The Chesapeake Steamship Company operates four vessels between Baltimore, Norfolk and other points. Of the 6,000 shares of this company the Southern owns 4,000 and the Atlantic Coast line 2,000 shares. The petition alleged that the railroads are not in competition with the water lines owned, and that the lines of steamships are not in competition one with another, and that they are now being conducted in the interest of the public and are of advantage to the convenience of commerce.

The Main Issue

The Interstate Commerce Commission ought to be careful to avoid giving the idea that it is hunting for an excuse to delay doing simple justice to the railroads. The announcement made by Commissioner Harlan that the commission will not act on the plea for a 5 per cent. advance in freight rates until it investigates the practices of the roads in making allowances for lighterage, for "spotting" cars and for the use of industrial spur lines is open to that construction.

It is all very well for the commission to tell the railroads that they can save a good deal of revenue, but the commission has known for many years that the agreements with the mills existed, while yet it has not hitherto been moved to preach economy along that line.

The country will approve the commission's urging the railroads to discontinue allowances to shippers; but it is far more interested in seeing the commission redress a little the balance of many successive years of encroachment on railroad revenues. The government has aided and abetted in fixing on the roads enormous new charges for wages, material, equipment and taxes, without ever once offsetting these new burdens by a provision for larger income.

The bigger question should not be obscured by the smaller. A notable stimulation of business would result from a definite assurance to the railroads that they are not expected to submit indefinitely to the creation of ten new sources of expenditure without the compensating creation of one new source of revenue.

—New York Tribune.

Commission and Court News

INTERSTATE COMMERCE COMMISSION

The commission has suspended from February 5 to May 25 a tariff of the Chicago, Milwaukee & St. Paul containing increased rates to apply in official classification territory.

The commission has suspended from February 15 to June 15 certain schedules in a Chicago, Milwaukee & St. Paul tariff, increasing the rates on cement in less than carloads from Mason City, Iowa, to Beach, N. D.

The commission has suspended from February 21 to June 21 a tariff of the Washington & Rockville, providing for increased passenger fares between Somerset, Md., and points in the District of Columbia.

The commission has suspended from February 10 to June 10, certain schedules in tariffs of the Southern Pacific, and the Santa Fe, whereby increased rates were proposed on green and dry hides and sheep pelts in less than carloads, from certain points in Texas, Arizona and New Mexico, to Los Angeles and other points in California.

The commission has suspended from February 13 to June 13 certain provisions in a tariff of W. E. Renneker, agent, cancelling through rates on oranges in carloads from points in Florida to Charleston and Huntington, W. Va., via Cincinnati and the Chesapeake & Ohio. Through rates to these points via Richmond, Va., and the Chesapeake & Ohio are continued in effect.

Fabrication-in-Transit Charges

Opinion by Commissioner Meyer:

The respondents in this case have attempted to increase the charge for the service of stopping shipments of structural steel to be fabricated in transit at points in central freight association territory from 1½ cents to 2½ cents per 100 lb. The commission holds that the cost figures submitted even as corrected do not show the advisability of such an increase, and that rate comparisons indicate that if a change is made the substantial rate equality for which the transit privileges were established would be lost. The commission also finds that the rules governing fabrication in transit should be more uniform in the tariffs of the carriers. These rules should be so changed as to specifically provide for substitution of material drawn from the lines of different carriers and different territories. They should provide for the proper accounting and the cancellation of inbound billing to cover outbound shipments, local consumption, waste or shrinkage; for frequent checking of unfabricated and fabricated material with billing on hand; and the cancellation of billing in excess of such material on hand, requiring the use of the oldest billing for that purpose. Transit privileges in this particular case should not be further extended. Articles upon which fabrication in transit is allowed should only include all those necessary for the fabrication of bridges and buildings and should be made uniform in the carriers' tariffs. (29 I. C. C., 70.)

The Separation of Rail and Water Lines

The first of the investigations that will be held by the commission under the provisions of the Panama Canal Act was held before Commissioner McChord at Washington on February 17. The application involved was that of the Pennsylvania asking that it be allowed to continue its water connections, especially that with the Erie & Western, or Anchor Line. The first witness, James C. Evans, vice-president of the Erie & Western and its operating officer, read into the record a statement covering the history of water transportation on the lakes, and described in some detail the passenger service rendered by his line. W. H. Johnson, general western agent of the Anchor Line at Chicago, explained in detail the methods of soliciting business. The company does little passenger advertising, for it depends upon the Pennsylvania to do that for it. Freight traffic is solicited at the lake ports of call by Anchor Line representatives, but at New York, Philadelphia, etc., representation

is joint with that of the Pennsylvania. Mr. Johnson denied that the Star Union Line, organized by the Pennsylvania to solicit business for it, endeavored to influence the shipment of freight over the all-rail lines as compared to rail and water lines. At the afternoon session Mr. Johnson emphatically denied that there was any combination between the standard lake carriers to keep up the rates, but inferred that while there may be times when they got together there were other times when the presence of the tramp boats made that of no avail. E. C. Bates, assistant freight traffic manager of the Pennsylvania Railroad, explained in detail the difference between the Union and Empire lines, emphasizing the fact that they were merely trade names. H. C. Barlow, traffic director of the Chicago Association of Commerce, who had been called by the commission, did not believe that a divorcement was wise. The commission has ample power to cope with the situation and to establish reasonable rates as things are at present. He felt that if the present system were disrupted it would be difficult to secure sufficient ground for terminals. The interests he represents would prefer that there be no change until after the decision on the present rate advance case.

Fourteen applications have now been received from railroads desiring to continue their ownership of steamboat lines, the latest being that from the New York Central & Hudson River.

Duluth Log Rates

Opinion by the commission:

It is proposed to increase the rates on logs from points in Minnesota upon the main line of the Great Northern to Superior, Wis., from 2 cents per 100 lb. with an additional charge of \$2 per car at destination to from 3½ cents to 4½ cents. The commission finds that such an increase is not justified, but holds that in accordance with the decision in *Pulp and Paper Manufacturers' Traffic Association v. C. M. & St. P.*, an increase from 2.5 to 2.9 cents is allowable. (29 I. C. C., 420.)

Wichita Not to Be a Rate Breaking Point

Wichita Board of Trade v. Abilene & Southern, et al. Opinion of the commission:

Wichita, Kan., alleges that it suffers a disadvantage as compared to Kansas City, Mo., a rate-breaking point for shipments of grain and grain products, and asks that it, too, be granted a rate-breaking system instead of the transit privileges it now has. The commission finds that such a change is inadvisable, for other changes would have to be made at other competing points and the entire present scheme of rates upset. Nor has the commission the power to order the carriers to establish all possible routes by way of Wichita for grain from Kansas fields to the south and west. (29 I. C. C., 376.)

Unreported Opinions

Chamberlain Cartridge & Target Company v. Lake Shore & Michigan Southern et al.

The commission finds that rates on targets and target traps from Cleveland and Findlay, Ohio, are not unreasonable.

Orgill Brothers & Company v. Louisville & Nashville et al.

Certain rates charged on woven wire fencing in carloads from Adrian, Mich., to Memphis, Tenn., are not found to have been unreasonable. Complaint dismissed.

Harry R. Browne v. Southern Railway et al.

The commission awards reparation on certain carload shipments of pine lumber from Kennedy, Ala., to Cincinnati, Ohio.

Sawyer & Austin Lumber Company v. St. Louis, Iron Mountain & Southern et al.

The commission finds that the complainant was overcharged on certain carload shipments of box shooks from Pine Bluff, Ark., to Fort Worth.

Paten & Burns v. Lehigh Valley et al.

The commission bars a claim under Section 16 of the act to regulate commerce.

Washburn Crosby Milling Company, Inc., v. Baltimore & Ohio Southwestern.

Although defendant's tariff provided for the application of through rates on the milled product of grain from point of

origin to final destination when milled at Louisville, Ky., full local rates inbound and outbound to eastern destination were charged on certain shipments. It is held that such constitutes overcharging.

Albert Miller & Company v. Chicago, St. Paul, Minneapolis & Omaha, et al.

The commission finds that certain charges collected on a shipment of potatoes from North Branch, Minn., originally consigned to St. Louis, Mo., and reconsigned to Alton, Ill., were not unreasonable.

Spokane Cycle & Supply Company v. Spokane International et al.

The commission finds that certain charges on three carloads of motorcycles and a mixed carload of motorcycles and sidecars from Springfield, Mass., to Spokane were unreasonable. Reparation awarded.

Standard Oil Company v. Pennsylvania Company et al.

The commission finds that the rates charged on a shipment of two carloads of tank iron, Martinsville, Ill., to Whiting, Ind., were not unreasonable.

T. G. Long & Co. v. St. Louis & San Francisco.

The commission finds that the complainants were overcharged because defendants charged the rate for a double deck car for a shipment of hogs when a single deck car was ordered.

Holt Manufacturing Company v. Oregon-Washington Railroad & Navigation Co. et al.

The commission finds that a gas engine shipped from East Portland, Ore., to Douglas, Wash., was not misrouted.

Memphis Freight Bureau v. Illinois Central et al.

The rate on lumber from stations on the New Orleans Great Northern to Memphis, Tenn., is not unreasonable.

Dorschel Produce Co. v. Chicago, Milwaukee & St. Paul.

The commission finds that certain charges on a carload of apples from Greenleaf, Wis., to Calumet, Mich., were in accordance with the published tariff and are not unreasonable.

Rates on baskets to points west of the Missouri river.

It was proposed to increase the carload rating on baskets originating in western trunk line territory and destined for points west of the Missouri from third class to second class. Upon a protest that the change would disturb the rate relationship between Lincoln, Neb., and Omaha, the carriers have agreed to apply the third class differential of 4 cents over the Omaha rates.

STATE COMMISSIONS

A hearing was held on February 12 before the Illinois Public Utilities Commission on the proposed advance of one cent per 100 lb. in grain rates throughout the state, corresponding to an advance in interstate rates which has been allowed by the Interstate Commerce Commission. Downstate grain dealers protested against the advance, but E. B. Boyd, appearing for the Chicago Board of Trade, urged that it be allowed in order to preserve an even basis of rates as between the primary markets.

General order No. 5 of the Public Service Commission of Pennsylvania requires all electric cars to be brought to a stop before crossing steam railroads; and where there is no watchman the conductor must go ahead on foot to make sure that the crossing is clear; but at crossings of yard tracks the companies may provide, by agreement, that the men in charge of the freight cars on the steam road shall flag the crossings. Agreements between companies are to be reported to the investigator of accidents of the Public Service Commission. This officer also is to have supervision over the installation of safety devices at specially dangerous crossings of all kinds. Freight trains shifting at night over crossings must have a light on the leading end, not only on main tracks, but also in yards.

PERSONNEL OF COMMISSIONS

Edward W. Hines, recently appointed one of the examiner-attorneys of the Interstate Commerce Commission, was born in Butler county, Kentucky, and was brought up at Bowling Green, Warren county. He was admitted to the bar in 1881 at Frankfort

and practiced law there until 1902. During ten years of that time—from 1886 to 1896—he was official reporter of the Court of Appeals of Kentucky. He removed to Louisville in 1902, and there practiced law before the state and federal courts, the Kentucky Railroad Commission and the Interstate Commerce Commission until appointed to his present position.

Arthur Benton Pugh, whose appointment as examiner-attorney for the Interstate Commerce Commission, has been announced, was born in Hampshire county, Va. (now West Virginia). He was educated in the public schools and at the University of Virginia, and was admitted to the bar in 1878. He engaged in active practice in West Virginia and Virginia until 1897, and then was assistant attorney for the Interior Department at Washington for a number of years. He was special assistant to the attorney general of the United States from 1906 to 1910, and as chief counsel for the government in the then pending land-fraud prosecutions, conducted the pioneer case of United States versus Hyde, Schneider and others, from its inception in

A. B. Pugh

1904 to its conclusion, in 1908. Mr. Pugh was appointed attorney for the Interstate Commerce Commission in September, 1910, and he assumed the duties of his present position of examiner-attorney, on the first day of this month.

Orville F. Berry, of Illinois, whose appointment as examiner-attorney for the Interstate Commerce Commission has been announced, has for the past five years been chairman of the Illinois commission. He was born February 16, 1852, in McDonough county, Illinois. He removed when a child to Hancock county, Illinois, where he worked on a farm and attended the public schools. In 1876 he moved to Carthage, where he has ever since resided. He read law and was admitted to the bar in 1877. He entered into partnership with Judge Thomas C. Sharp, and has been actively engaged in practice and business ever since. In 1884 he was elected mayor of his own city and served as such ten years. For eight years he served as local trustee of Carthage College

O. F. Berry

and lecturer on history and commercial law. In 1888 he was elected to the state senate and was a member of that body for twenty years. From 1896 to 1900 he was attorney for the State Insurance Department of Illinois; and from 1900 to 1904 acted as special attorney for the Department of Justice under Attorney General Hamlin. In 1909 he was appointed Chairman of the Railroad and Warehouse Commission of the state, as noted above, and served as such until January 1, 1914.

C. B. Spencer, as previously announced, has been appointed senior civil engineer of the track and road department of the Western district of valuation, Interstate Commerce Commission, with headquarters at Kansas City. Mr. Spencer is a graduate

of the high school of Joplin, Mo.; of the engineering department of the state university at Rolla, Mo., and the engineering department of Cornell University, Ithaca, N. Y. He began his railroad experience in 1894. He has been with the Kansas City, Fort Scott & Memphis, and the St. Louis & San Francisco as rodman, assistant engineer, resident engineer, division engineer, district engineer, and office engineer. He resigned from this last position to take up his new work for the government.

Frederick F. Schaller, who has recently been appointed signal engineer of the safety appliance division of the Interstate Commerce Commission, was born in Needham, Mass., in 1872. He attended the public schools at Natick and Wellesley, Mass., and in 1896 completed the electrical engineering course of the Massachusetts Institute of Technology. He then engaged in electrical construction work, and in January, 1898, began railroad work on the Boston & Albany, by which road he was employed in signal work for four and a half years in various capacities from draftsman to foreman of construction. When the new South station at Boston was opened, he was in charge of a signal construction gang in the Boston yard. In 1902 he became assistant signal

F. F. Schaller

engineer of the Lake Shore & Michigan Southern. During the next two years he was employed in engineering work connected with the first installation of continuous automatic block signals on the Lake Shore, and he also assisted in the installation of the La Salle street interlocking plant at Chicago. Since 1904 Mr. Schaller had been in the engineering department of the Hall Switch & Signal Company. For several years he served in the capacity of estimating engineer, but he has in addition had charge of the company's circuit work and exercised supervision over the ordering of materials for all construction contracts.

James E. Howard, who has recently been appointed engineer-physicist in the safety appliance division of the Interstate Commerce Commission, was born at Palmer, Mass., on June 26, 1851. He attended Nichols Academy, Dudley, Mass., and the Highland Military Academy at Worcester, Mass. In 1910 the honorary degree of Master of Science was conferred upon him by Dartmouth. For a while, in the early '70s, Mr. Howard was employed as a civil engineer by the city of Boston. In 1873, however, he was engaged in engineering work in connection with the location and construction of the St. Paul & Pacific, now the Great Northern. From 1874 to 1879, he was employed at Chicopee, Mass., as a mechanical engineer in the construction of testing machinery

J. E. Howard

and engaged in conducting experiments connected with the testing machines now at the Watertown arsenal. In 1880, he became engineer of tests at that arsenal, and from 1910 to the present

he has been employed as engineer-physicist by the Bureau of Standards at Washington. Mr. Howard is a member of the American Society for Testing Materials. He is an expert on the strength of materials and the experimental determination of strains in structures, bridges, buildings, street pavements, railroad track and roadbed and hulls of ships at sea. He has written many articles on subjects involving the strength of materials and the Reports of the Tests of Metals and Industrial Materials published as government documents were prepared under his direction while he was employed as engineer of tests at Watertown arsenal. During the past two years he has made a number of reports for the Interstate Commerce Commission on broken rails.

COURT NEWS

B. F. Yoakum, in his answer to the suit filed by the receivers of the St. Louis & San Francisco against former officers and directors of the road, on February 11 asked that the suit be dismissed insofar as it applies to him. Similar motions were filed by three other defendants, Thomas H. West, James Campbell and A. S. Greig.

F. W. Ellis, vice-president of the Armour Car Lines, on February 11 filed in the United States District Court at Chicago his answer to the petition of the Interstate Commerce Commission for an order compelling him to answer questions concerning the profits of the car lines and their relation to Armour & Company. In the answer Mr. Ellis asserts that the Armour Car Lines is not a common carrier and that the commission has no jurisdiction and denies that "the Armour Car Lines is controlled by Armour & Company, to obtain concessions from published rates or to obtain undue or unreasonable advantages." Judge Landis ordered a hearing on the petition on February 19.

In the Federal Court at Trenton, N. J., last week, Morris Rutherford, vice-president of the Lehigh & Hudson River, was indicted by the grand jury on a charge of receiving illegal concessions from the Pennsylvania Railroad in charges for the transportation of coal. The coal referred to in the indictment was carried by the Pennsylvania to Phillipsburg, N. J., and there delivered to the Lehigh & Hudson River, the destination of the coal being Warwick, N. Y., about 60 miles north of Phillipsburg. The rate per ton to Phillipsburg is \$2; but by billing through the proportion accruing to the Pennsylvania was reduced to \$1.59 per ton; and the charge in the indictment seems to be based on information that the coal was not carried through to Warwick.

The United States government filed suit in the district court at Salt Lake City on February 11 asking for a complete dissolution of the relations between the Southern Pacific and the Central Pacific, alleging that the control of the latter by the Southern Pacific constitutes a violation of the anti-trust law. The government also asks injunctions to restrain the Central Pacific from recognizing the Southern Pacific as the owner of its stock, and to restrain the Southern Pacific from voting Central Pacific stock or receiving any profit from the operation of the road. The government takes the position that the Central, from Ogden westward to San Francisco, is parallel to and a competitor of the Southern, and that the Pacific railroad laws intended that the Union Pacific and Central Pacific should constitute a through route. "Through its control of the Central Pacific," says the petition, "the Southern Pacific company prevents joint traffic or pro-rating arrangements between the former and the Union Pacific, naturally its most important transcontinental and interstate connection. The Southern Pacific so adjusts its freight rates and passenger fares on traffic originating in the Central Pacific territory north of San Francisco as to discriminate against transportation eastward over the joint transcontinental route of the Central and Union Pacific railroads and other eastern connections, thereby preventing competition and denying equal advantages and facilities as to rates, time and transportation." The petition further declares that in operation the management favors its "Sunset route," its joint rail and water service between the Eastern seaboard and the Pacific coast, allowing as little business as possible to go through the Ogden gateway and over the Central Pacific tracks.

Railway Officers

Executive, Financial, Legal and Accounting

R. J. Dillon has been appointed auditor of the Houston & Brazos Valley, with headquarters at Freeport, Tex., succeeding C. C. Moore, resigned.

C. N. Whitehead, assistant to the president of the Missouri, Kansas & Texas, has been elected vice-president, with headquarters at St. Louis, Mo.

J. L. White has been appointed assistant to the president of the Chicago, Indianapolis & Louisville, with office at Chicago, and T. H. Hayes has been appointed chief clerk in the president's office.

C. C. Barry, who resigned recently as assistant controller of the Southern Pacific, has been appointed auditor of the San Pedro, Los Angeles & Salt Lake, with headquarters at Los Angeles, Cal., succeeding H. I. Bettis, deceased.

G. D. Locke, president and general manager of the Kansas City & Memphis, at Rogers, Ark., has relinquished the duties of general manager, and Oliver C. Lisman, of Elkins, N. C., has been elected first vice-president and general manager.

W. S. Battle, Jr., who became a member of the valuation committee of the Norfolk & Western in May, 1913, will resume his duties on March 1 as general claim agent, and J. B. Baskerville, acting general claim agent at Roanoke, Va., has been appointed assistant general claim agent.

William R. Scott, who has been appointed vice-president and general manager of the Southern Pacific, with headquarters at San Francisco, Cal., as has already been announced in these



W. R. Scott

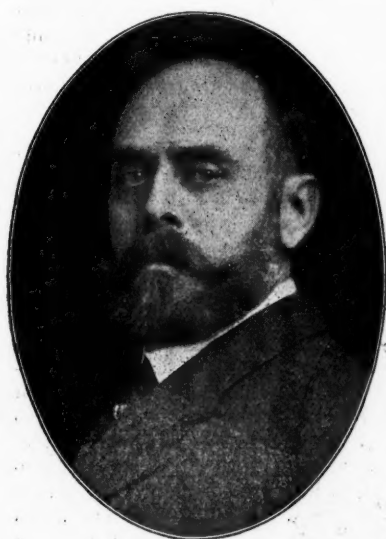
columns, was born November 8, 1860. He received a common school education and began railway work in 1881 as locomotive fireman on the Atchison, Topeka & Santa Fe. In July, 1884, he was promoted to locomotive engineer, and seven years later was made traveling engineer. He was then appointed trainmaster of the Northern division of the Gulf, Colorado & Santa Fe in August, 1898, and from June, 1900, to March, 1901, he was division superintendent of the same road at Cleburne, Tex. From the latter date to July, 1903, was general superintendent of the Fort Worth & Denver

City. In September, 1903, Mr. Scott went to the Southern Pacific as assistant superintendent of the Sacramento division, and in November of that year was made superintendent of the Salt Lake division. In June, 1905, he was transferred to the superintendency of the Western division, and in September, 1907, was promoted to general superintendent of the Northern district. Two months later he was made assistant general manager; in July, 1912, he was appointed general manager, and he now becomes vice-president and general manager, as above noted.

Warren Sherman Palmer, whose election as president of the Northwestern Pacific, with office at San Francisco, has been noted, was born in San Francisco, Cal. He graduated from the College of Civil Engineering, University of California, at the age of eighteen, and immediately thereafter entered the bridge and building department of the Central Pacific. He served four years as a bridge and house carpenter and draftsman on struc-

tural and architectural work, and then went into the field, serving eight years as rodman, instrument man and chief of party on reconnaissance, location and construction of railroads on the Pacific coast. In 1890 he became resident engineer in charge of maintenance of the First district, Southern Pacific lines, with headquarters at Oakland, Cal. In 1898 he assumed the duties of assistant superintendent of the western division of the Southern Pacific, in addition to those of division engineer. In 1901 he became superintendent of the Sacramento division of the Southern Pacific, with headquarters at Sacramento, Cal. In 1902 he became superintendent of the Western division, with headquarters at Oakland, and in 1905 he was appointed general superintendent of the Northern district, with headquarters at San Francisco. In 1907 he became general manager of the Northwestern Pacific, a new property formed by the consolidation of five independent rail lines, and in January of this year he became president and general manager.

Charles S. Churchill, chairman of the valuation committee of the Norfolk & Western at Roanoke, Va., has been appointed assistant to the president, in immediate charge of federal valuation, and will perform such other duties as may be assigned to him. Mr. Churchill was born on September 22, 1856, at New Britain, Conn., and graduated from Sheffield Scientific School at Yale University. He began railway work in 1879, and for one year was engaged on surveying projected railroads in Connecticut. From 1880 to 1881 he was engaged on the construction of the Meadville & Linesville, and then for three years was division engineer on location and construction on the Pittsburgh, McKeesport & Youghiogheny, now a part of the Pittsburgh & Lake Erie. On January 1, 1884, he became principal assistant engineer on construction of the Pennsylvania Schuylkill Valley division of the Pennsylvania Railroad, and from May, 1887, for one year was engineer of maintenance of way on the Shenandoah Valley, now a part of the Norfolk & Western. From May to October, 1888, he was engineer in charge of the Ohio extension of the Norfolk & Western, and then to January, 1903, was engineer of maintenance of way of the same road. He was promoted to chief engineer on January 1, 1903, and on May 1, 1913, became chairman of the valuation committee formed for the purpose of devising a plan of valuation of the company's property in accordance with the new federal law and to carry on the work. Mr. Churchill is past vice-president of the American Society of Civil Engineers, also past president of the American Railway Engineering Association.



C. S. Churchill

Operating

H. A. Boomer, general superintendent of the Lake Erie & Western and the Northern Ohio, is now general manager, with headquarters at Indianapolis, Ind.

E. L. King, trainmaster of the Southern Pacific at Dunsmuir, Cal., has been appointed superintendent of telegraph, with headquarters at San Francisco, Cal., succeeding F. S. Rawlins, deceased.

Henry W. Thornton, general superintendent of the Long Island at Jamaica, N. Y., has been appointed general manager of the Great Eastern Railway of England, with headquarters at London.

Edward J. Edmunds and John T. Taffany have been appointed trainmasters of the Erie, with headquarters at Buffalo, N. Y., and B. J. Bromley has been relieved of the duties of trainmaster and assigned to other duties.

A. E. Walker, superintendent of the Amarillo division of the Chicago, Rock Island & Pacific at Amarillo, Tex., has been transferred to Eldorado, Ark., as superintendent of the Louisiana division. E. Van Hecke succeeds Mr. Walker.

Arthur L. Mills, formerly general superintendent of the Toledo, St. Louis & Kansas City, has been appointed general manager of the Ft. Smith & Western, with headquarters at Ft. Smith, Ark., succeeding W. M. Bushnell, resigned.

J. McGuire has been appointed assistant superintendent of the newly created Portland division of the Spokane, Portland & Seattle, with headquarters at Portland, Ore. E. B. Heath has been appointed trainmaster of the same division at Portland.

P. L. McManus, superintendent of the Chicago, Indianapolis & Louisville, has been appointed general superintendent, with headquarters at Lafayette, Ind. J. M. Baths and W. H. Fogg, trainmasters at Lafayette, have been appointed division superintendents at that place, and J. R. Stem, chief despatcher, and D. J. Clarke, yardmaster, succeed Messrs. Baths and Fogg.

C. S. Krick, superintendent of the Manhattan division of the Pennsylvania Railroad, with headquarters at New York, has been appointed superintendent of the Philadelphia Terminal division with headquarters at West Philadelphia, Pa., succeeding J. B. Baker, deceased. Robert V. Massey, superintendent of the New York, Philadelphia & Norfolk at Cape Charles, Va., succeeds Mr. Krick, and C. I. Leiper, principal assistant engineer of the Philadelphia, Baltimore & Washington at Wilmington, Del., succeeds Mr. Massey.

Abiel D. Edgar, who has been appointed assistant superintendent of the New Jersey Central division of the Central of New Jersey with headquarters at Jersey City, N. J., as has been announced in these columns, was born on February 22, 1869, at Mauch Chunk, Pa., and educated in the public schools at Lansford. He began railway work on July 6, 1887, as a telegraph operator on the Central of New Jersey and has been in the continuous service of that road ever since. In 1893, he was promoted to train despatcher, becoming assistant trainmaster in 1899. The following year he was appointed trainmaster which position he held at the time of his recent appointment as assistant superintendent of the same road as above noted.

J. H. Jackson, having resigned as superintendent of the Southeastern division of the St. Louis & San Francisco, the duties of that office will be assumed temporarily by J. H. Doughty, general agent, with title of acting superintendent and headquarters at Birmingham, Ala. C. T. Mason, assistant superintendent at Springfield, Mo., has been appointed superintendent of the Western division, with headquarters at Enid, Okla., succeeding J. M. Chandler, who has been transferred to Francis, Okla., as superintendent of the Red River division in place of C. F. Hopkins, who has been appointed superintendent of the Southwestern division, with office at Sapulpa, Okla., to succeed S. T. Cantrell, resigned. Effective February 15.

The following changes on the St. Louis & San Francisco are announced, effective March 1: T. B. Coppage, superintendent of the Northern division at Ft. Scott, Kan., is appointed superintendent of transportation, with headquarters at Springfield, Mo. O. H. McCarty, superintendent of the River & Cape division at Chaffee, Mo., succeeds Mr. Coppage. C. H. Claiborne, assistant superintendent of the River & Cape division, takes the place of Mr. McCarty as superintendent of that division. J. H. Doggrell, superintendent freight loss and damage claims, is appointed assistant superintendent of transportation, with office at Springfield, and G. E. Whitlam, chief clerk to assistant general manager, succeeds Mr. Doggrell. A. W. McElvaney, assistant superintendent freight loss and damage claims, takes the place of Mr. Whitlam, and the former office is abolished. J. F. Frazier, night chief despatcher at Chaffee, is appointed assistant superintendent of the River & Cape division, succeeding Mr. Claiborne.

C. I. Leiper, who has been appointed superintendent of the New York, Philadelphia & Norfolk, with headquarters at Cape Charles, Va., was born at Wallingford, Pa., on October 28, 1874. He graduated from Swarthmore College in 1895, and later took a special course at the University of Pennsylvania. He entered

the service of the Pennsylvania Railroad as a rodman in 1899, at Jersey City, N. J., and went to Altoona as transitman on February 1, 1901. The following month he became assistant supervisor on the Maryland division. He was promoted to supervisor on the same division in 1903, and later served as supervisor on the Pittsburgh division and the present Manhattan division. On August 15, 1909, he was promoted to division engineer and served on the Manhattan division until 1911, when he went to the New York division in the same capacity. In June, 1913, he was promoted to principal assistant engineer of the Philadelphia, Baltimore & Washington, with headquarters at Wilmington, Del., which position he held at the time of his recent appointment as superintendent of the New York, Philadelphia & Norfolk as above noted.

Frank J. Evans, whose appointment as superintendent of the Pecos division of the Atchison, Topeka & Santa Fe, with headquarters at Clovis, N. M., has already been announced in these



F. J. Evans

columns, was born December 21, 1867, at Johnstown, Ohio. He was educated in the common schools, and began railway work May 1, 1887, with the Atchison, Topeka & Santa Fe, in whose service he has continued ever since. He was employed as operator and agent at smaller stations until January, 1904, when he was made agent at Emporia, Kan. He remained in the latter position for six years, and on January 1, 1910, was appointed transportation inspector. In August of that year he became chief train dispatcher at Emporia, and in February, 1911, was advanced to trainmaster of the Pecos division at Clovis, N. M. From the latter position Mr. Evans was promoted on February 1 to superintendent of the Pecos division, as above noted.

Edward Dailey Levy, assistant general manager of the St. Louis & San Francisco, has been appointed general manager, with office at St. Louis, Mo., effective March 1. Mr. Levy was



E. D. Levy

born in Paris, Tex., October 16, 1879, and was educated in the public schools of Paris and Dallas. He began railway work February 1, 1898, as a stenographer in the office of the manager of the Santa Fe Refrigerator Dispatch at Chicago, and afterwards served in a similar capacity for the assistant superintendent of motive power and equipment of the Michigan Central; in the office of the general superintendent of the Chicago, Milwaukee & St. Paul, and as secretary to the industrial commissioner of the Atchison, Topeka & Santa Fe. He became secretary to W. C. Nixon, then superintendent of the Chicago division of the Atchison, Topeka & Santa Fe, in August, 1898, and with the exception of two periods, has been with Mr. Nixon practically ever since

that time. When he first left the service of Mr. Nixon he was employed as a stenographer in the office of the master mechanic of the Atchison, Topeka & Santa Fe Coast Lines at Needles, Cal.; in the office of the master mechanic of the Fort Worth & Denver City at Fort Worth, Tex., and in the office of the vice-president and general manager of the Mexican Central at City of Mexico. When he again took a position with Mr. Nixon, the latter was general superintendent of the Santa Fe at Galveston. He remained with him a short time and then became secretary to the superintendent of the Kansas City Southern at Texarkana, Ark., and later chief clerk to the trainmaster of the same road. In the latter part of 1900, he re-entered Mr. Nixon's service as a stenographer, later becoming file clerk and then secretary to Mr. Nixon. In February, 1902, Mr. Levy was made a transportation clerk in the office of Mr. Nixon, who at that time was general manager of the Gulf, Colorado & Santa Fe at Galveston, Tex. In April, 1903, he was promoted to senior clerk in the general manager's office, and in May, 1904, was made chief clerk to the general superintendent of the Gulf, Colorado & Santa Fe at Galveston, which position he held until August 15, 1906, when he went to the St. Louis & San Francisco as assistant superintendent of car service. On June 1, 1907, he was made superintendent of transportation, and on May 1, 1911, assistant general manager of the St. Louis & San Francisco, which position he now leaves to become general manager, succeeding W. T. Tyler.

C. L. Hinkle, whose appointment as general superintendent of the Toledo, St. Louis & Western, with headquarters at Frankfort, Ind., has already been announced in these columns, began



C. L. Hinkle

railway work in 1883, with the Evansville & Terre Haute, and was operator, station agent and bill clerk until 1888. He was then clerk and chief clerk in the mechanical department of the Chicago & Eastern Illinois, and was general storekeeper from 1891 to 1893, when he went to the Ohio Southern, and for seven years was storekeeper and chief clerk in the mechanical department. In 1900 he became connected with the Detroit, Toledo & Ironton, and for one year was chief clerk to the chief engineer; from 1901 to 1902 was traveling auditor, and the following year was chief clerk to the superintendent. Mr. Hinkle then became chief clerk to the general superintendent of the Toledo, St. Louis & Western, and in 1907 he was made chief clerk to the general manager and vice-president in charge of operation and maintenance of that road and the Chicago & Alton, being promoted to the position of assistant to general manager of those roads in 1910. In March, 1912, he was appointed superintendent of the Toledo, St. Louis & Western, which position he held until his recent promotion to that of general superintendent, as noted above.

George LeBoutillier, whose appointment as superintendent of the Richmond division of the Pittsburgh, Cincinnati, Chicago & St. Louis, which comprises the Southwest System of the Pennsylvania Lines West of Pittsburgh, has already been announced in these columns, was born February 2, 1876, at Cincinnati, Ohio. He was educated at the University of Cincinnati, and has been in the service of the Pennsylvania Lines since August 1, 1895, when he commenced railway work, being rodman and leveler on the engineering corps of the Pittsburgh, Cincinnati, Chicago & St. Louis until November, 1900. He was then assistant engineer of the Richmond division at Richmond, Ind., and in August, 1901, was transferred to the Cleveland & Pittsburgh railway as assistant engineer at Cleveland, Ohio. In July, 1903,

he was made engineer maintenance of way of that road at Cleveland, and in March, 1905, he became engineer maintenance of way of the Cincinnati division of the Pittsburgh, Cincinnati, Chicago & St. Louis at Cincinnati. He was made division engineer of the Pittsburgh division at Pittsburgh, Pa., November 1, 1912, where he remained until February 1, when he was promoted to the superintendency of the Richmond division at Richmond, Ind., as above noted.

Charles S. Krick, who has been appointed superintendent of the Philadelphia Terminal division of the Pennsylvania Railroad, with headquarters at West Philadelphia, Pa., was born on



C. S. Krick

March 16, 1866, at Reading, Pa. He was educated in the public schools also at the Carroll Institute, Reading, and in June, 1887, graduated from Lafayette College. The following month he entered the service of the Pennsylvania Railroad as rodman on the Schuylkill division and later was transferred to Altoona. On December 14, 1890, he was appointed assistant supervisor of the Tyrone division, and in April, 1892, was transferred in the same capacity to the Philadelphia division, becoming acting supervisor about three years later of the Schuylkill division. He was promoted to supervisor in June, 1896, and was subsequently supervisor on the Middle division and later on the Pittsburgh division. On January 1, 1903, he was made assistant engineer of the Eastern and Susquehanna divisions and later was transferred to the Philadelphia Terminal division, becoming principal assistant engineer of the Philadelphia, Baltimore & Washington in January, 1906. In April of the following year he was made superintendent of the New York Terminal division, and on January 1, 1912, when the Hudson and New York Terminal divisions were combined to form the Manhattan division, he was appointed superintendent of that division, at New York, which position he held at the time of his recent appointment as superintendent of the Philadelphia Terminal division as above noted.

Robert V. Massey, who becomes superintendent of the Manhattan division of the Pennsylvania Railroad, with headquarters at New York, was born on September 29, 1871, at Dover, Del., and graduated from the Sheffield Scientific School of Yale University in 1892. In September of the same year he entered the service of the Pennsylvania Railroad in the engineering department, and in 1895 he was attached to the office of the principal assistant engineer at Altoona, Pa. On November 1, of the same year, he was appointed assistant supervisor at Freeport, and on April 1, 1897, became assistant supervisor of the Baltimore division of the Northern Central at Baltimore, Md. Two years later he was transferred as assistant supervisor to the Middle division of the Pennsylvania and in August, 1900, was promoted to supervisor on the Schuylkill division. In April, 1902, he went to the Maryland division of the Philadelphia, Baltimore & Washington in the same capacity, and on December 15, 1902, was transferred to the Pittsburgh division of the Pennsylvania. He became division engineer of the Schuylkill division in April, 1907, and on January 1, 1909, was appointed division engineer of the New York division, and was promoted in March, 1911, to superintendent of the New York, Philadelphia & Norfolk, which position he held at the time of his recent appointment as superintendent of the Manhattan division of the Pennsylvania Railroad as above noted.

O. T. Waring, who has been appointed superintendent of the Waycross district of the Atlantic Coast Line, with headquarters at Waycross, Ga., as has been announced in these columns, was

born on February 3, 1881, at Pittsburgh, Pa. He graduated as a civil engineer from the University of Pennsylvania in 1902, and in July of the same year began railway work in the engineering department of the Baltimore & Ohio. The following July he was promoted to assistant division engineer and in August, 1905, went to the Atlantic Coast Line as assistant engineer, leaving that company in 1906 to go to the Charleston & Western Carolina in the same capacity. He was promoted to assistant superintendent of that road in November, 1907, and the following year returned to the service of the Atlantic Coast Line as roadmaster. From September, 1909, to October, 1910, he was acting engineer of roadway and was then appointed assistant engineer. From January 1, 1911, to December, 1912, he was superintendent of the same road and the Winston-Salem, at Florence, S. C. He was then appointed engineer of roadway of the Atlantic Coast Line at Savannah, Ga., which position he held at the time of his appointment as superintendent of the same road, as above noted.

Traffic

A. Mallum has been appointed acting commercial agent of the Chicago, Milwaukee & St. Paul at Duluth, Minn., vice C. L. Kennedy, promoted.

J. F. Hennessy, Jr., has been appointed soliciting freight agent of the Missouri, Kansas & Texas at Houston, Tex., in place of J. S. McConnell, transferred.

C. H. Evans has been appointed industrial agent of the Missouri, Kansas & Texas, with headquarters at St. Louis, Mo., succeeding R. G. Hanson, Jr., resigned.

S. E. Dewey, commercial agent of the Grand Trunk at Pittsburgh, Pa., has been appointed commercial agent, with office at New York, and D. M. Crawford succeeds Mr. Dewey.

W. P. Hinton, general passenger agent of the Grand Trunk Pacific at Winnipeg, Man., has been appointed assistant passenger traffic manager, with headquarters at Winnipeg.

W. C. Teare has been appointed traveling freight agent of the Seaboard Air Line, with office at Cincinnati, Ohio, succeeding H. M. Williams, resigned, to accept service with another company.

G. H. Dougherty, traveling freight agent of the Kansas City Southern, with office at Dallas, Tex., has been appointed soliciting freight agent at Beaumont, Tex., succeeding C. P. Hoch, who has been transferred to New York as traveling freight agent.

Frank D. Austin has been appointed manager, with office at New York, of the Mt. Jewett Route, which operates a freight service over the Baltimore & Ohio and the Erie. He succeeds Russell S. Underwood, who has been promoted in the Erie service.

J. M. Morisey, division passenger agent of the Illinois Central at Dubuque, Iowa, has been appointed district passenger agent at Indianapolis, Ind. H. S. Gray, district passenger agent at St. Paul, Minn., succeeds Mr. Morisey, and A. J. McDougall, district passenger agent at Indianapolis, succeeds Mr. Gray.

H. E. Arnold has been appointed commercial agent of the New York Central & Hudson River, and the West Shore, with office at Lowell, Mass. John P. Collins and George E. Mace have been appointed traveling freight agents, with offices at Lowell, Mass., and F. H. Owen has been appointed traveling freight agent, with office at Greenfield, Mass.

J. W. Willis has been appointed general agent of the Atlanta, Birmingham & Atlantic, with headquarters at Talladega, Ala., succeeding C. A. Land, resigned to go to another company, and H. M. Williams has been appointed traveling freight agent, with office at Cincinnati, Ohio, succeeding L. J. Steinhauer, resigned to engage in other business.

J. J. Koch, general freight agent of the Pennsylvania Lines West of Pittsburgh, at Pittsburgh, Pa., has been appointed assistant freight traffic manager, succeeding J. P. Orr, who was retired on January 1. Guy S. McCabe, general western freight agent of the North West System at Chicago, succeeds Mr. Koch. J. E. Weller, general western freight agent of the Pittsburgh, Cincinnati, Chicago & St. Louis at Chicago, succeeds Mr. McCabe, and J. D. Couffer, agent of the Green Line at Chicago, succeeds Mr. Weller.

Engineering and Rolling Stock

Frank S. Wheeler, supervisor of the Erie at Deposit, N. Y., has been appointed a division engineer.

D. E. Fitzgerald has resigned as assistant superintendent of motive power of the St. Louis & San Francisco.

J. E. Crawford, acting chief engineer of the Norfolk & Western and the Williamson & Pond Creek, at Roanoke, Va., has been appointed chief engineer, effective March 1.

J. Dwyer has been appointed roadmaster, and J. E. Long master carpenter, of the Portland division of the Spokane, Portland & Seattle, with headquarters at Portland, Ore.

J. C. Auten, division engineer of the Philadelphia, Baltimore & Washington at Wilmington, Del., has been appointed principal assistant engineer, succeeding C. I. Leiper, transferred.

J. K. Conner, first assistant engineer of the Lake Erie & Western and the Northern Ohio, has been appointed chief engineer, with headquarters at Indianapolis, Ind., succeeding William G. Atwood, resigned.

John A. Galvin has resigned as architect of the Louisville & Nashville to accept a position with the division of valuation, Interstate Commerce Commission. J. C. Haley, who has been Mr. Galvin's assistant, has been appointed architect to succeed him, with office at Louisville, Ky., and J. W. Smith succeeds Mr. Haley.

C. W. Montgomery, supervisor of division No. 20, of the Pennsylvania Railroad, at Hollidaysburg, Pa., has been appointed supervisor of division No. 5, with office at Harrisburg, succeeding H. L. Thomas, promoted; William E. Brown, supervisor, at St. Marys, Pa., succeeds Mr. Montgomery, and J. E. Zullinger has been appointed assistant supervisor of division No. 3, succeeding W. E. Dunbar, promoted.

Frederick Grant White, whose appointment as signal engineer of the Chicago Great Western, with office at Chicago, has already been announced in these columns, was born February 6, 1882, at Waterloo, Wis. He studied electrical engineering at the University of Wisconsin, completing a four year course in 1905. In July of that year he began railway work with the Pennsylvania Lines West of Pittsburgh as signal repairman at Chicago, and in August, 1906, he was transferred to the Eastern division of the Pittsburgh, Ft. Wayne & Chicago at Rochester, Pa., as signal maintainer and repairman. From April, 1907, to May, 1908, he was assistant construction foreman on the same division at Alliance, Ohio, and was then draftsman in the signal engineer's office at Pittsburgh, Pa., for one year. He left the Pennsylvania Lines in May, 1909, to go to the Northern Pacific as draftsman and designer in the signal department at St. Paul, Minn., for three months. He then became signal supervisor of the Chicago Great Western at St. Paul, in March, 1910; he was appointed assistant to the special signal engineer, and in November was made assistant signal engineer, resigning in July, 1912. The following three months he was with the Canadian Pacific at Montreal, Que., as valuation signal engineer, leaving that road to become signal inspector of the Great Northern at St. Paul, from which road he now returns to the Chicago Great Western as signal engineer, as above noted.

T. W. Heintzelman, superintendent of motive power of the Southern Pacific at Sacramento, Cal., has been appointed general superintendent of motive power, with headquarters at San Francisco, succeeding H. J. Small, retired, and T. W. Younger,

superintendent of motive power at Portland, Ore., has been appointed superintendent of motive power of the Northern district, with headquarters at Sacramento, succeeding Mr. Heintzelman.

H. Osborne, assistant superintendent of motive power of the Canadian Pacific at Montreal, Que., has been appointed assistant mechanical superintendent, with headquarters at Montreal. W. E. Woodhouse, assistant superintendent of motive power at Winnipeg, Man., has been appointed superintendent of motive power Eastern lines, with headquarters at Montreal. F. R. Pennyfather, district master mechanic at Cranbrook, B. C., has been appointed master mechanic of the Manitoba division, with headquarters at Winnipeg, Man., in place of R. Preston, and George G. Ommanney has been appointed special engineer to the president. He will perform such duties as may be assigned to him from time to time.

T. W. Heintzelman, superintendent of motive power of the Southern Pacific at Sacramento, Cal., has been appointed general superintendent of motive power, with headquarters at San Francisco, succeeding H. J. Small, retired. T. W. Younger, superintendent of motive power at Portland, Ore., has been appointed superintendent of motive power of the Northern district, recently organized, comprising the Portland, Shasta, Sacramento and Salt Lake divisions, with headquarters at Sacramento, Cal., succeeding Mr. Heintzelman. The office of district engineer is abolished. H. B. Titcomb and R. M. Drake, district engineers at San Francisco and Los Angeles, respectively, have been appointed maintenance of way assistants, reporting to the assistant chief engineer at San Francisco. F. L. Burckhalter will have charge of construction work in Oregon.

Purchasing

F. Davidson has been appointed purchasing agent of the Chicago, Indianapolis & Louisville.

B. M. Blackburn has been appointed acting general storekeeper of the Chicago & North Western, with headquarters at Chicago, in place of Walter M. Carroll, deceased.

OBITUARY

J. B. Marshel, commercial agent of the Chicago, Milwaukee & St. Paul at Dallas, Tex., died in that city on February 11.

Sir Frank Ree, general manager of the London & Northwestern Railway of England, died in London on Tuesday of this week. He had been in the service of the company 40 years, and general manager since 1909.

John W. Callahan, general manager of the Chicago Tunnel Company, died on February 13 at his home in Chicago, aged 51 years. Mr. Callahan formerly was trainmaster of the Belt Railway of Chicago, and subsequently was general manager of the Indiana Harbor Railroad.

Walter M. Carroll, general storekeeper of the Chicago & North Western, died at Chicago on February 11, after an illness of several months. He was born at Hemlock Lake, N. Y., December 7, 1870, and had been with the North Western for twenty-five years. For a number of years he was chief clerk to the vice-president and later to the president, being made assistant general storekeeper in 1909, and general storekeeper in 1910.

George L. Carman, of Chicago, formerly superintendent of the Western Railway Weighing Association, died at Los Angeles, Cal., on February 11. Mr. Carman was born September 7, 1838, in New York City. He entered railway service in March, 1855, and was consecutively train boy, Cleveland & Toledo; clerk in local freight office of the Mississippi & Missouri at Iowa City, Iowa; cashier in the local freight office of the Chicago, Rock Island & Pacific at Davenport, Iowa, until August, 1871, when he went to the Rock Island & Peoria and was successively general agent and general freight and ticket agent to February, 1875. From 1876 to 1879, he was division freight agent of the Rockford, Rock Island & St. Louis division of the Chicago, Burlington & Quincy. He was then for eight years commissioner for the Chicago, Burlington & Quincy and Wabash, St. Louis & Pacific pools, and of the Northwestern, Central Iowa and Davenport, Rock Island & Moline traffic associations. Subsequently, until 1904, he was superintendent of the Western Railway Weighing Association.



F. G. White

Equipment and Supplies

LOCOMOTIVE BUILDING

THE SOUTHERN RAILWAY is in the market for locomotives.

THE CHICAGO, MILWAUKEE & ST. PAUL is in the market for twelve 200-ton electric locomotives for use on the Three Forks-Deer Lodge line.

THE ILLINOIS CENTRAL, noted in the *Railway Age Gazette* of last week as being in the market for locomotives, is inquiring for 50 mikado and 25 switching locomotives.

THE DELAWARE, LACKAWANNA & WESTERN has ordered 14 Pacific type locomotives from the Lima Locomotive Corporation, and 4 of the same type from the American Locomotive Company.

THE TENNESSEE CENTRAL, reported in the *Railway Age Gazette* of February 6 as being in the market for two consolidation type locomotives, has ordered that equipment from the American Locomotive Company. These locomotives will have 20 x 26-inch cylinders, 51-inch driving wheels, a total weight in working order of 165,000 lb., and a steam pressure of 185 lb.

THE ATLANTIC COAST LINE has ordered 25 Pacific type locomotives from the Baldwin Locomotive Works. These locomotives will have 22 x 28 in. cylinders and 63 in. diameter driving wheels. They will be equipped with wagon top boilers with combustion chamber, the Walschaert type of valve gear, Moon headlights, Consolidated safety valves, Hancock injectors, Schmidt superheaters, Star gages, Detroit lubricators, 9½ in. Westinghouse air pumps, Franklin fire doors, O'Connor fire door flanges, complete installations of flexible staybolts, Damascus bronze bearings, Watters' tank strainers and Farlow Westinghouse draft gear. Contracts for all the various specialties have already been closed.

CAR BUILDING

THE ERIE is in the market for one combination and 4 club cars.

THE BUTTE ANACONDA & PACIFIC is in the market for 157 cars.

THE PHILADELPHIA & READING is in the market for 1,000 hopper cars.

THE LAKE ERIE, FRANKLIN & CLARION is in the market for 100 box cars.

THE FLORIDA EAST COAST is in the market for from 1,000 to 2,000 box cars.

THE CAMBRIA & INDIANA has ordered 500 hopper cars from the Cambria Steel Company.

THE VIRGINIAN has ordered 1,000 gondola cars from the Standard Steel Car Company.

THE PORTLAND, EUGENE & EASTERN is in the market for 3 baggage, mail and express cars.

THE ILLINOIS CENTRAL is in the market for 500 box cars to be used by the Central of Georgia.

THE NORFOLK & WESTERN has ordered 5 dining cars from the American Car & Foundry Company.

THE NEW JERSEY, INDIANA & ILLINOIS has ordered 100 box cars from the Pressed Steel Car Company.

THE MORGANTOWN & KINGWOOD has ordered 200 steel hopper cars from the Pressed Steel Car Company.

THE TEXAS & PACIFIC is said to be in the market for gondola and box cars. This item has not been confirmed.

THE GREAT NORTHERN has ordered 30 all-steel 73-ft. first-class coaches from the Barney & Smith Car Company.

THE CHICAGO & NORTH WESTERN has ordered 2,000 center sills from the American Car & Foundry Company.

THE RICHMOND, FREDERICKSBURG & POTOMAC has ordered 15 ballast cars from the Rodger Ballast Car Company.

THE ATLANTIC COAST LINE is in the market for 6 70-ft. coaches, 4 70-ft. combination mail and baggage cars and 5 60-ft. express cars.

THE BADGER RAILWAY & LIGHT COMPANY, Milwaukee, Wis., which will build a 22 mile line from Whitewater to Lake Geneva, Wis., is considering the purchase of some gas-electric or gasolene cars.

THE SOUTHERN RAILWAY, reported in an unconfirmed item in the *Railway Age Gazette* of last week as inquiring for cars, is in the market for 400 steel flat cars, 500 coal cars, 100 steel underframe stock cars, 1,500 steel underframe box cars and 25 steel underframe poultry cars.

THE NORTHERN PACIFIC has ordered 250 all-steel ore cars from the Western Steel Car & Foundry Company. They are to be delivered before the opening of the ore carrying season in June, and will be placed in service in the Cuyuna range country in northern Minnesota.

SIGNALING

The Hall Switch & Signal Company announces that it has taken a contract for the installation of an electric interlocking plant for the New York Municipal Railways Company at Myrtle avenue and Broadway junction, Brooklyn, N. Y. The Municipal Railways Company, controlled by the Brooklyn Rapid Transit Company, is to operate some of the new subway and elevated lines to be built in New York City. The Hall company has had a small installation of its all electric interlocking in service at Ottawa, Ontario, since last August, and reports satisfactory results.

DEVELOPMENT OF THE CHILIAN RAILWAYS.—The Chilean Senate and Chamber of Deputies has recently authorized an expenditure of approximately \$23,000,000 for the purchase of railway material and the construction of new lines.

SPANISH RAILWAY ENCOURAGES AGRICULTURE.—The Soria Railway, a line not quite 90 miles long in the province of Soria in Spain, is conducting an energetic campaign of education to improve agricultural conditions along its line. Many of the railway stations have been provided with little agricultural museums where the farmers and others interested may obtain all kinds of useful information. They are told how to use fertilizing material; how to buy machinery, seeds, live stock, etc. They are advised as to the construction of district roads and told about various industries which might be successfully introduced. But most important of all, they are fully informed of the manner of soliciting subventions from the central government.

RAILWAYS IN THE INDIAN STATE OF GWALIOR.—Gwalior, in the central part of India, is one of the more important of the native states. It has a total area of 25,041 square miles and a population of nearly 3,000,000, of which 120,000 are in the city of Gwalior, situated about six hours' journey by train from Delhi. The state is divided into two detached portions by other territory; the southern portion, although the smaller, was at one time noted for its great production of Malwa opium. The state contains three important railways. First, it is traversed by the Great Indian Peninsula railway, connecting Bombay and Delhi. Second, the state itself owns a light railway of 2 ft. gage about 250 miles in length. It is said that this line had its origin in the fondness for mechanics of His Highness the Maharaja, His Highness having operated the first cars for personal amusement before realizing that the enterprise had a more important public use. The line now makes gross earnings of over \$100,000 a year, and is a most helpful factor in the economic development of the state. Third, His Highness also has a controlling interest in another railway of but little less importance. This is a most ingenious device used for passing around the after-dinner coffee, cordials and cigars at his guest table. It consists of a miniature locomotive and train of cars constructed of silver, which operating from an electric battery and running over a diminutive track laid along the table, are so constructed that they automatically stop before each guest. The equipment for the line was imported from the United States.

Supply Trade News

Stanton D. Cowl is now representing the Gould Coupler Company, Depew, N. Y., in southern territory.

M. J. Commerford, who had been connected with the tie plate and track department of the Railroad Supply Company, Chicago since 1900, died on February 17 at Chicago.

The Chicago offices of the Okadee Company have been moved to new quarters on the sixteenth floor of the Lytton building, Jackson boulevard and State street.

Charles I. Webb has been elected vice-president of the International Seal & Lock Company, Chicago, manufacturer of the Tyden car seal. He will continue in his capacity as sales manager.

George P. Nichols & Brother, Chicago, has received an order from the Cleveland, Cincinnati, Chicago & St. Louis for nine electric tractors. This is said to be the largest order of this kind ever placed.

Harry S. Whitehair has resigned his connection with McCord & Company, Chicago, and is now in charge of the eastern railway sales for the Chicago Varnish Company, with office at 50 Church street, New York.

The Kelly Reamer Company, Cleveland, Ohio, has recently received through its English agents, C. W. Burton, Griffiths & Company, London, E. C., a \$1,200 order for Kelly adjustable floating reamers and boring tools from a large English manufacturer.

The Independent Pneumatic Tool Company, Chicago, has announced the following appointments of district managers effective March 1: R. T. Scott, manager Pittsburgh district, with office at 1208 Farmers' Bank building, Pittsburgh, Pa.; F. H. Charbono, manager Southern district, with office at 1629 Candler building, Atlanta, Ga.

C. W. Owston, who for the past eighteen months has been in charge of the purchasing, stock and shipping departments of the McCord Manufacturing Company, Detroit, Mich., has been appointed to the railway appliance sales department of that company. Mr. Owston was at one time connected with the Atha Steel Casting Company, Newark, N. J.

H. J. Force, chemist and engineer of tests of the Delaware, Lackawanna & Western, has received patent papers on his autoclave test on Portland cement, which has been incorporated in the standard specifications for Portland cement of the Delaware, Lackawanna & Western, published in the *Railway Age Gazette* of January 24, 1914, page 158.

Charles A. Carscadin, who for several years was associated with the Globe Seamless Steel Tubes Company, has been elected president of the National Car Equipment Company, recently organized, with offices in the Railway Exchange, Chicago. George A. Woodman, formerly of the Kirby Equipment Company, is general manager of the company.

Scott R. Hayes has been appointed assistant to the president of the New York Air Brake Company, New York, effective March 1. Mr. Hayes has been with the Railway Steel-Spring Company, New York, since its organization, and has filled the positions, respectively, of eastern sales agent, general sales agent and vice-president. He resigns from the last position to go to the New York Air Brake Company.

The following changes in the organization of the Union Draft Gear Company, Chicago, have been announced: W. G. Krauser, mechanical engineer, has been appointed assistant to the vice-president, in charge of the first district; James E. Tarelton, assistant mechanical engineer, has been appointed assistant to the vice-president, in charge of the second district; J. W. Hathaway, now assistant to the vice-president, will have charge of the third district; H. Barnard, chief draftsman, has been appointed mechanical engineer, and C. J. Gorman has been made inspector. The office of assistant mechanical engineer is abolished.

TRADE PUBLICATIONS

PUMPS.—The Platt Iron Works Company, Dayton, O., has recently issued a bulletin describing the company's line of "Smith-Vaile" Triplex Power Pumps.

LOCK WASHERS.—The Reliance Manufacturing Company, Massillon, Ohio, has recently issued a very full catalog illustrating Reliance Lock Washers and containing tables of sizes, list prices and code words.

STEEL SHEET PILING.—The Lackawanna Steel Company, Lackawanna, N. Y., has issued bulletin No. 106 which describes the Lackawanna Steel Sheet Piling. The booklet contains several illustrations showing the possible uses of the piling.

ELECTRIC HEADLIGHTS.—The Remy Electric Company, Anderson, Ind., has recently issued a booklet describing in very full detail its model D American electric headlight. There are also included detailed directions concerning the proper maintenance and care of the apparatus.

LOCOMOTIVE STOKERS.—The Locomotive Stoker Company, Schenectady, N. Y., has recently issued catalog No. 13, illustrating and describing the Type C Street locomotive stoker. The booklet aims to describe the appliance in full detail and to give one an idea of the strong points in its design and construction.

MAGNETOS.—The Remy Electric Company, Anderson, Ind., has recently issued a well gotten up booklet describing in detail the policy of the reorganized Remy Electric Company. The first part of the booklet contains also several views of the company's shops; the latter half, a description of Remy apparatus.

WATER STILLS.—The International Wagner Water Stills Company, Chicago, has issued an illustrated catalog describing various types of Wagner automatic water stills, for operation by gas or by steam, of capacities ranging from ½ gallon per hour up, and containing a number of tables giving information regarding distillation under various conditions.

POSTAL CAR LIGHTING.—The Safety Car Heating & Lighting Company, 2 Rector street, New York, has issued a supplement to its postal car pamphlet previously issued, giving the location of lighting units for postal cars in accordance with the railway mail service specifications. It includes diagrams showing the lighting units placed to accommodate the new arrangement of registered mail cases in the 60 ft. steel full postal cars.

TRAVELING CRANES.—The Niles-Bement-Pond Company, New York, has just issued its 1914 catalog of electric traveling cranes. About one-quarter of the book, which contains 100 pages, is devoted to the cranes themselves and their various accessories. The remainder of the booklet contains illustrations of various installations. There are included Niles electric traveling cranes for indoor and outdoor use, traveling trolleys, traveling hoists and hand power cranes.

HEATING AND VENTILATION.—The B. F. Sturtevant Company, Hyde Park, Boston, Mass., published the first edition of the book known as "Heating and Ventilation" about twenty-five years ago. Since that time various new editions have been brought out in order to keep pace with the increasing knowledge of the subject and the improvements in the apparatus, but until the present edition no decided change has been made in the form of the book. Recent progress, however, has been so rapid that it has been deemed necessary to revise the volume completely. In the latest edition an endeavor has been made to make the volume more generally useful as a book of reference, which will be equally valuable to the engineer and to the layman. The new edition contains two parts. Text matter takes up one part and is divided into ten chapters. There is a thorough discussion of all phases of the problem of heating and ventilation. Consideration is given, for instance, to the composition, property and principal characteristics of air. Due regard is given to a general study of the apparatus and the solving of many of the problems involved. There are also descriptions of typical installations and apparatus, including a brief description of the Sturtevant apparatus. The second part of the book consists of a collection of tables for the use of the student and engineer covering the subject of heating and ventilation in general and of Sturtevant apparatus in particular. The book contains about 325 pages. It is bound in cloth and is so well gotten up in general that the publishers of it have deemed it wise to charge a small price to partly cover the cost of its publication.

Railway Construction

ATLANTA & NORTH GEORGIA.—Incorporation will be asked for in Georgia to build from Atlanta, Ga., north to Creighton, about 50 miles. The company is to have a capital of \$1,200,000 and headquarters at Atlanta. A. B. Kellog, R. W. Underwood, J. N. Ellis, J. W. Tindall, all of Atlanta, and H. P. Hoyt, Kirkwood, are incorporators.

ATLANTIC, WAYCROSS & NORTHERN.—An officer is quoted as saying that the company is planning to build an extension from Kingsland, Ga., west to Folkston, about 20 miles.

BADGER RAILWAY & LIGHT COMPANY.—An officer writes that a contract has been given to the Raulf Construction Company, Milwaukee, Wis., to build from Whitewater through Elkhorn to Lake Geneva, 22 miles. About 2 miles of sidings will also be laid. Construction work is to be started in March. The contract calls for the grading, bridgework, track laying, etc., also for building a car house, office building, stations and freight sheds. The company will use either gas-electric cars or direct driven gasoline cars on the line. H. B. Kamschulte, president and general manager, Milwaukee. (February 6, p. 296.)

CENTRAL CITY, GREENVILLE & DRAKESBORO (Electric).—Application has been made for a charter in Kentucky, by this company, with \$500,000 capital, to build an electric line to connect Central City, Ky., with Drakesboro and Greenville. The incorporators include L. L. Dunham, New York; W. H. Netherland, Louisville, Ky., and H. Meredith, Greenville. (See Kentucky Roads, January 23, p. 201.)

COLETA RAILROAD.—An officer writes that contracts are to be let in about three months to build from Coleta, Ill., south to Agnew, 8.5 miles. Hugh S. Brown, Coleta, may be addressed. (February 6, p. 296.)

FRONTENAC, MULBERRY & ARCADIA (Electric).—Application will be made for a charter in Kansas to build from Pittsburg, Kan., north via Frontenac, Mulberry and Arcadia, about 15 miles. J. S. Patton is president, and the headquarters of the company are at Pittsburg.

HELENA SOUTHWESTERN.—Work will be started in April it is said, from Helena, Ark., west to Pillows and to timber lands near Elaine. E. C. Nelson, Helena, is an incorporator, and the Chicago Mill & Lumber Company are said to be interested.

MISSOURI INTERURBAN.—Surveys have been made, it is said, for a line from Sedalia, Mo., east via Smithton and Bunceton to Prairie Home, about 45 miles. A. W. Nelson, president. B. H. Colby, Security building, St. Louis, is interested.

NEW ORLEANS, MOBILE & CHICAGO.—An officer is quoted as saying that work will be started in a short time on a branch from Beaumont, Miss., south to a connection with the Louisville & Nashville at Ansley.

NEW YORK SUBWAYS.—The New York Public Service Commission, First district, has awarded the contract for Section No. 1 of Route No. 18, the White Plains Road branch of the existing subway, to the Oscar Daniels Company for \$914,400. Section No. 1 extends from the subway terminus to Burke avenue. Bids have been opened for the construction of Section No. 2 of Route No. 16, the Jerome avenue branch of the Lexington avenue subway. This section is from One Hundred and Eighty-second street north over Jerome avenue to Woodlawn road. The contract will probably be given to the lowest bidder, the Cooper & Evans Company, at \$1,076,831. (January 23, p. 209.)

NORTHWESTERN OF CANADA.—The Canadian parliament has been asked to incorporate this company to build from a point near township 67, range 18, west of the 5th meridian in a southeasterly direction to a crossing of the Athabaska river, about range 7, thence via Edmonton, Alta., and Camrose, thence crossing the 4th meridian about township 32, to a crossing of the South Saskatchewan river, about township 29, range 11, west of the 3rd meridian, and continuing southeasterly towards Lake Johnson and easterly to Maryfield, township 10, range 30, west first meridian, then east to Virden, Man., thence north crossing

the Assiniboine river to a point near Penrith, and easterly to Carberry and Winnipeg, Man., thence to Molson and continuing to Fort William and Port Arthur, Ont. Foster, Martin, Mann, Mackinnon & Hackett, Montreal, Que., are solicitors for applicants.

OTTAWA, BROCKVILLE & ST. LAWRENCE (Electric).—Application has been made for an extension of time to build from Ottawa, Ont., south through the counties of Carleton, Grenville and Leeds to Brockville. N. Belanger, Ottawa, Ont., is secretary.

PACIFIC TRANS-CANADA & HUDSON BAY.—This company, which was incorporated in Canada in 1912, is applying for an extension of time to build from Edmonton, Alta., north to Athabaska Landing, thence northwesterly to a point northeast of the Lesser Slave lake and north to a junction of the Loon river with the Peace river, or the junction of the Red and Peace rivers near Fort Vermilion, thence to Fort Smith on Slave river, and from a point on the above line near the crossing of the Wabiska river or the Loon river, easterly via Fort McMurray on the Athabaska river, and along the Clearwater and Churchill rivers through Saskatchewan to Fort Churchill or Port Nelson on Hudson Bay; from a point near the crossing of the Wabiska or Loon rivers west to Peace river crossing, and along the north side of Peace river via Laurier Pass to Prince Rupert or the Portland canal, B. C. Smith & Johnston, Ottawa, Ont., are the solicitors.

PRINCE EDWARD & HASTINGS.—The Canadian parliament is being asked to extend the time for the construction of lines in Ontario as follows: From Trenton to Gardenville, thence easterly through Albury, Rednersville and Rossmore to Belleville, and northwesterly to Frankford, thence to Trenton; from a point on the above line between Albury and Rednersville to Wellington, and easterly through Bloomfield to Picton; from Picton northerly to Demorestville, and easterly through Northport and Solmesville to Ferry Point; from Bloomfield southwesterly to West Point; from Picton southwesterly to West Point; from Picton southeasterly to Black river; from Picton easterly through Waupoos to Indian Point. Permission is also asked for to build an additional line from Brighton to Picton, thence easterly to Kingston. Pringle & Guthrie, Ottawa, Ont., are the solicitors.

RICHLAND NORTHERN.—Incorporated in the state of Washington with \$1,000,000 capital and headquarters at Seattle. The plans call for building from Richland, Benton county, Wash., north to a connection with the Chicago, Milwaukee & St. Paul. It is thought that the line will be built to Hanford on the Priest Rapids line of the C. M. & St. P., about 30 miles. The incorporators include M. F. Haynes, B. F. Knapp and F. J. O'Brien.

SAN DIEGO & ARIZONA.—This company will issue bonds, the proceeds of which will be used to complete the line from San Diego, Cal., into the Imperial Valley, about 14 miles.

SAN MIGUEL DEVELOPMENT COMPANY'S LINE.—Surveys have been made, it is said, for a line to connect the ore fields in San Miguel county, Colorado, with the Rio Grande Southern at Placerville, 76 miles. C. B. Schley, president, Colorado Springs, and B. Wells, vice-president.

SOUTHERN ILLINOIS RAILWAY & POWER COMPANY.—It is said that this company, which operates an electric line from Eldorado, Ill., southwest via Harrisburg to Carriers Mills, 17 miles, plans to build a line from Harrisburg west to Marion, thence north via White Ash, Johnson City and West Frankfort to Benton. It is understood that a line is also to be built to Herrin, and that the company plans to extend the line eventually northwest to East St. Louis. W. H. Schott, chief engineer, Chicago.

TAMPA, ATLANTIC & GULF.—An officer is quoted as saying that the company plans to build from Tampa, Fla., south via Punta Gorda, to Charlotte Harbor, thence east via Lake Okeechobee to Fort Lauderdale, 230 miles. There are to be six drawbridges and about five miles of trestles on the line. The West Coast Construction Company, Tampa, has a construction contract. W. J. Epperson, president; J. B. Walker, chief engineer.

TAMPA & GULF COAST.—An officer is quoted as saying that track laying is now under way on an extension to St. Petersburg, Fla. The road is now in operation from Tarpon Springs, Fla., to Lutz Junction, 22 miles. (May 29, 1913, p. 1206.)

TEXAS ROADS.—Residents of Aransas Pass, Tex., have offered a bonus of \$50,000 to R. A. Love, of San Antonio, for a rail-

road which he proposes to build from Aransas Pass north to Goliad, about 60 miles. The offer also includes 20 acres for terminal grounds and right of way to the Taft ranch lands in San Patricio county. It is planned to extend the line from Goliad to a connection with either the International & Great Northern or the Missouri, Kansas & Texas.

Announcement is made by Secretary D. A. O'Brien, of the Brownsville Chamber of Commerce, that a \$100,000 bonus for a proposed railroad from Brownsville, Tex., to Point Isabel has been subscribed, and that the surveys will be started within the next few days. It is planned to have the 21-mile line in operation by April, 1915.

VANCOUVER RAILWAY & OCEAN TERMINAL.—Incorporation is being asked for in Canada by this company to build a double track railway from the south side of False creek, east of Main street, Vancouver, B. C., westerly along the south side of False creek and English bay, to the south side of English bay, west of Blanca road, Point Grey; also to construct railway terminals, operate vessels, and carry on a general railway and transportation business. Deacon, Deacon & Wilson, Vancouver, B. C., are solicitors for applicants.

RAILWAY STRUCTURES

ALBANY, N. Y.—An officer of the Delaware & Hudson writes that the contract recently given to J. Henry Miller, Baltimore, Md., calls for putting up a combined office building and freight house at Quay street, Albany. The new building is to be of reinforced concrete construction with granite facing and will be five stories high. The cost of the work will be about \$485,000. (February 18, p. 346.)

BROOKLYN, N. Y.—The Long Island and the New York Consolidated railroads have given a contract to Parsons & Lantry for constructing a highway bridge to carry Eighth avenue, between Sixty-first and Sixty-second streets, in Brooklyn, over the tracks of these two roads.

NASHVILLE, TENN.—Plans are being made by the City of Nashville, Davidson county and the Louisville & Nashville to jointly build a reinforced concrete viaduct over the railway tracks at Cleveland street, Nashville. The estimated cost of the viaduct is \$30,000.

ST. PAUL, MINN.—Ground is being cleared at the corner of Jackson and Fourth streets in St. Paul, for a building to hold the general offices of the Great Northern, Northern Pacific, Great Northern Ore Company and the Northwestern Trust Company. The new structure will be 12 stories high, and will have 20 acres of floor space. The improvements will cost \$3,500,000, and work will be started April 1. Charles S. Frost, designer of the Chicago & North Western passenger station in Chicago, and the Great Northern station in Minneapolis is the architect. A contract has been given to Butler Brothers for tearing down the old buildings.

SPRINGFIELD, MASS.—A contract has been given to the O'Brien Construction Company, New York, for constructing an underpass, it is said, under the tracks of the Boston & Albany at Water street in Springfield. Holbrook, Cabot & Rollins will construct an underpath at Dwight street under the Union Station. The work is to be completed by May 1, 1915, and will cost about \$328,000.

ELECTRIFICATION OF THE SWISS FEDERAL RAILWAYS.—The government of Switzerland is planning to electrify 1,875 miles of the federal railways in the next few years.

A NEW RAILWAY LINE IN NORWAY.—It has been proposed for some time to construct an electric railway from Bergen, the second city in Norway, to the summit of Mount Floien, and to build a modern hotel at the mountain terminal. The idea has lately been brought to a head because of the construction of the mountain railway between Bergen and Christiania and the establishment of the Norwegian-American steamship line with the resulting great increase in passenger and tourist traffic. The project now at last seems sure of realization, for the city council of Bergen has appropriated \$26,800 towards the total estimated cost of about \$160,000. If a modern hotel is finally decided upon, however, the total cost will reach \$268,000.

Railway Financial News

BOSTON & MAINE.—On Tuesday Howard Elliott, Moorfield Storey and Walker D. Hines, representing the New York, New Haven & Hartford's interest in the Boston & Maine, held a conference with Attorney General McReynolds and his two assistants, T. W. Gregory and J. C. Adkins. Governor Walsh, of Massachusetts, and G. W. Anderson, a member of the Massachusetts railroad commission, were also present at the conference, and it is understood that some difference of opinion arose as to the appointment of the trustees who were to take over the New Haven's holdings of Boston Railroad Holding Company stock, which carries control of the Boston & Maine, and also as to the time at which the stock should be taken over.

A Boston press despatch says that a movement is under way to organize a protective committee to take care of the interests of the minority stockholders of the Boston & Maine.

GREAT NORTHERN.—The directors have voted to issue \$19,000,000 additional stock subject to the approval of the stockholders. Stockholders of record March 26, 1914, are to be offered the privilege of subscribing for new stock at par at the rate of one share of new stock for each 12½ shares now held. The proceeds of the sale of this stock are to be used to pay for securities of the Montana Eastern and of any other companies which the Great Northern may buy. On Tuesday, the day on which the announcement was made, Great Northern was selling on the New York stock exchange at about 130.

INTERBOROUGH RAPID TRANSIT.—An additional \$10,000,000 Interborough Rapid Transit first and refunding 53-year 5 per cent. bonds have been sold through J. P. Morgan & Co., New York, to the syndicate, including Lee, Higginson & Co., Boston, and Harris, Forbes & Co.; Kissel Kinnicutt & Co.; Wm. A. Read & Co., and White, Weld & Co., all of New York, which syndicate recently sold to the public \$30,000,000 of these bonds. Of the total \$156,000,000 of these bonds that are to be sold to provide for the construction of the New York subways, about half, including the present sale, have been sold.

LARAMIE, HAHN'S PEAK & PACIFIC.—A plan of reorganization has been formulated by the reorganization committee, of which A. J. Hemphill, W. F. Snyder, Henry Sanderson and Lawrence Barnum are members, and L. B. Franklin, secretary. The plan provides for \$550,000 cash to be raised through the assessment of 10 per cent. on the first mortgage refunding 6's, 20 per cent. on the 7 per cent. collateral trusts, 10 per cent. on the general mortgage 5's, 10 per cent. on the unsecured 7 per cent. notes, 10 per cent. on general creditors, 15 per cent. on the preferred stock and 1 per cent. on the common stock. The present capitalization of the company, including all liabilities, is about \$13,696,000. After providing \$550,000 cash, the capitalization of the new company is to be about \$6,690,000, with fixed charges of \$47,400.

NATIONAL RAILWAYS OF MEXICO.—The offer of the company to issue 3-year 6 per cent. notes in payment of January 1 interest on the 4½ per cent. prior lien bonds was accepted by the holders of over 91 per cent. of the notes; and since but 85 per cent. of the consents was necessary to make the plan effective, it went into effect on February 14.

NEW YORK CENTRAL & HUDSON RIVER.—This company has asked the New York Public Service Commission, Second district, for permission to issue \$70,000,000 refunding and improvement mortgage bonds. The company has already arranged for the extension of \$30,000,000 notes maturing March 1, and has \$20,000,000 additional notes due April 21. The company asks permission to sell its bonds on a basis of not less than 92½.

NEW YORK, NEW HAVEN & HARTFORD.—See Boston & Maine.

SOUTHERN PACIFIC.—As noted under the head of Court News, the government has begun a suit to compel the Southern Pacific to give up its control of the Central Pacific.